Colorado Department of Public Health and Environment

Hazardous Materials and Waste Management Division

Five-Year Review

Asarco Globe Site
Denver, Colorado

Prepared by:

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Approved:

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirements
ASARCO	American Smelting and Refining Company renamed Asarco Incorporated in 1975
CD	Consent Decree
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation Liability Act
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
DIP	Design Investigation Plan
DIR	Design Investigation Report
DW	Drinking Water
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FGD	Farmers and Gardeners Ditch
FNP	Former Neutralization Pond
FSP	Former Sedimentation Pond
GIS	Geographic Information System
HASP	Health and Safety Plan
HSS	Hospital Shared Services
IC's	Institutional Controls
IDD	Industrial Drainage Ditch
LFP	Localized Floodplain Plume
MCL's	Maximum Contaminant Levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOC	Notice of Completion
NPL	Superfund National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Units
PPM	Parts per million
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SOW	Statement of Work
SSC	State Superfund Contract
TBC	To Be Considered
TCLP	Toxic Characteristics Leaching Procedure
VBI70	Vasquez Boulevard and I-70 Superfund Site
WWTP	Wastewater Treatment Plant

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Executive Summary

The State of Colorado has conducted a second five-year review of the remedial actions performed at the Asarco Globe Plant Site located in Denver and Adams Counties, Colorado. The review was conducted from March through August 2004. Overall, the results of this second five-year review indicate that all immediate threats at the site have been addressed and the remedy is expected to be protective of human health and the environment after all components are completed as proposed. Long term protectiveness of the remedial actions will be verified through the annual monitoring. Current data indicate that the remedy is functioning as anticipated and will achieve performance objective once all components have been implemented. The only portion of the remedy that impacts current protectiveness is the sampling and remediation of commercial and industrial properties. It is expected that Asarco will begin implementation of that portion of the remedy in the 4th quarter of calendar year 2004.

The remedy for OU1 (Former Neutralization Pond) is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that would result in unacceptable risks are being controlled by maintaining a clean soil cover that is graded for proper drainage. Until the remedy is implemented, groundwater continues to be contaminated, requiring extraction from the Terrace Drain and treatment in the Wastewater Treatment Plant.

The remedy for OU2 (Groundwater and Surface Water) is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through continued extraction and treatment as well as natural attenuation, which is expected to require several decades to achieve. Exposure pathways that could result in unacceptable risk are being controlled and institutional controls are preventing exposure to contaminated groundwater.

Long-term protectiveness of the OU2 remedial action will be verified by maintaining quarterly monitoring of groundwater to fully evaluate the natural attenuation and potential migration of the floodplain plume towards the South Platte River. Current data indicate that levels of arsenic and cadmium exceed the MCLs. Current monitoring data indicate that the components of the remedy that are in place are functioning as expected to achieve groundwater cleanup goals.

The remedial action for OU3 (Community Soils and Vegetable Gardens) is protective because it has been completed. However, the commercial and industrial properties have not yet been thoroughly sampled or remediated. Therefore, the remedial action for a portion of the operable unit is not protective of human health and the environment at this time. Implementation of the commercial industrial property sampling and remediation need to take place to ensure protectiveness. The remedy is expected to be protective of human health and the environment upon completion.

OU4 (Plant Site) includes five components. The remedial actions at the Former Sedimentation Pond, Point Source and Fugitive Air Emissions, and the Spill and Runoff Control Pond are protective. However, because the remedial action for Surface Soils and Buildings has not yet been completed, the site is not protective of human health and the environment. Additional placement of community soils on the Plant will ensure protectiveness. Threats at the site have been addressed through stabilization and capping of contaminated soils and sediments, and the implementation of institutional controls. The remedy for buildings is protective in the short term because exposure pathways that could result in unacceptable risk are being controlled.

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Five Year Review Summary Form Five Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Asarco, Inc. (Globe Plant)		
EPA ID (from WasteLAN): COD 007063530		
Region: 8	State: CO	City/County: Denver/Denver&Adams
SITE STATUS		
NPL Status: □ Final, □ Deleted, ■Other (specify) proposed		
Remediation Status (choose all that apply): ■ Under Construction, ■ Operating, ■ Complete		
Multiple OUs? ■ Yes, □ No	Construction Complete date:	
Has site been put into reuse: No Please refer to text description for each OU.		
REVIEW STATUS		
Reviewing Agency: □ EPA, ■ State, □ Tribe, □ Other		
Author Name: Barbara O'Grady		
Author Title: Remedial Project Manager	Author Affiliation: CDPHE	
Review period: March 2004 to August 2004		
Date(s) of site inspection: 6/2004 through 7/2004		
Type of Review: ■ Statutory, □ Policy (□ Post-SARA, □ Pre-SARA, □ NPL-Removal Only) □ Non-NPL Remedial Action Site, □ NPL State Tribe Lead		
Review number: □ 1 (first), ■ 2 (second), □ 3 (third), □ Other (specify)		
Triggering action: □ Actual RA Onsite Construction at OU#, □ Actual RA Start at OU#, □ Construction Completion, ■ Previous Five-Year Review, □ Other (specify)		
Triggering action date (from WasteLAN): 02/06/99		
Due Date (five years after triggering action date): 02/06/04		

Five-Year Review Summary Form, cont.

Issues:

1) Completion of the FNP Operable Unit.
2) Continued groundwater monitoring.
3) Continued operation of the Waste Water Treatment Plant (WWTP).
4) Completion of the Final Medical Monitoring Report (FMMR).
5) Sampling and remediation of commercial/industrial properties.
6) Enforcement of institutional controls.
7) Continued placement of community soils on plant.
8) Establishment and maintenance of a vegetative cover.

Recommendations and Follow-up Actions:

1) Implement the remedy for the FNP as soon as funding becomes available.
2) Continue monitoring floodplain groundwater as well as Interceptor Trench.
3) Continue operation of the Terrace Drain and WWTP to enhance natural attenuation of down gradient groundwater.
4) Incorporate final biomedical data and trend analysis into the FMMR.
5) Sampling and remediation of commercial industrial properties is scheduled to begin before the end of 2004.
6) An Environmental Covenant between the State and Asarco will assure implementation of institutional controls.
7) A Consent Decree between Asarco, EPA, and the State will assure continued placement of VBI70 soils on the plant site as well as grading, compaction, and revegetation of those soils according to the requirements of the SOW.
8) The same Consent Decree will assure establishment of a vegetative cover to control erosion and windblown soils from leaving the property.

Protectiveness Statement: All immediate threats at the site have been addressed and the remedy is expected to be protective of human health and the environment after all components are completed as proposed.

Long Term Protectiveness: Long term protectiveness of the remedial actions will be verified through the annual monitoring. Current data indicate that the remedy is functioning as anticipated and will achieve performance objective once all components have been implemented.

Other Comments: The only portion of the remedy that impacts current protectiveness is the sampling and remediation of commercial and industrial properties. It is expected that Asarco will begin implementation of that portion of the remedy in the 4th quarter of calendar year 2004.

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1.0 INTRODUCTION

This five-year review report summarizes the status of actions taken pursuant to the Final Consent Decree, Order, Judgment, and Reference to Special Master for the Asarco Globe Plant Site located in Denver and Adams Counties, Colorado, that was approved by the United States District Court in Denver Colorado on July 15, 1993 pursuant to State of Colorado vs. Asarco Incorporated, Civil Action No. 83-C-2383. Appendix I of the Consent Decree consists of a Statement of Work (SOW) for Remedial Design and Remedial Action. The Superfund Record of Decision (ROD) was issued on February 18, 1993.

This five-year review is a statutory review of the Asarco Globe Plant Site required under the Comprehensive Environmental Response, Compensation Liability Act (CERCLA) and the National Contingency Plan for Oil and Hazardous Substances (NCP). The purpose of the review is to determine whether remedial response actions are protective of human health and the environment and to recommend ways to attain or maintain that protection. In accordance with the Comprehensive Five-Year Review Guidance, EPA 540-R-01-007, June 2001 (The Guidance) this five-year review does not reconsider decisions made during the remedy selection process but evaluates the implementation and performance of the selected remedies. The State of Colorado Department of Public Health and Environment (CDPHE) conducted this review.

This is the second five-year review completed for the Asarco Globe Plant Site. In keeping with the requirements of CERCLA 121 (c) and the NCP, the subsequent five-year review triggers from the signature date of the previous five-year review. The first Asarco Globe Plant Site five-year review was completed in February 1999.

The CDPHE Community Involvement Program is committed to promoting communication between citizens and CDPHE. The Community Involvement Plan (CIP) Update (Appendix A) describes the community involvement and public participation program developed for the Asarco Globe Plant Site in Denver, Colorado. This CIP updates the previous CIP, dated January 1995.

Overall, the results of this second five-year review indicate that all immediate threats at the site have been addressed and the remedy is expected to be protective of human health and the environment after all components are completed as proposed. Long term protectiveness of the remedial actions will be verified through the annual monitoring. Current data indicate that the remedy is functioning as anticipated and will achieve performance objective once all components have been implemented. The only portion of the remedy that impacts current protectiveness is the sampling and remediation of commercial and industrial properties. It is expected that Asarco will begin implementation of that portion of the remedy in the 4th quarter of calendar year 2004. Since hazardous substances, pollutants, or contaminants remain at the Site, another five-year review will be required in August 2009.

2.0 SITE BACKGROUND

The Asarco Globe Plant is located at 495 East 51st Avenue, Denver, Colorado. The plant is situated on approximately 78 contiguous acres along the west edge of the South Platte River floodplain, 2.7 miles upstream of the river's confluence with Clear Creek. Most of the Asarco Globe Plant is located on a terrace that rises about 30 to 60 feet above the floodplain. The Plant includes 53 current and former manufacturing and support buildings used for production, offices, and wastewater treatment.

The Asarco Globe Plant Site boundary or footprint includes residential, commercial, and industrial properties surrounding the Asarco Globe Plant that were historically impacted by smelter related contaminants. Under the Consent Decree, the actual site boundary was to be defined by following contamination out from the plant center until a clean perimeter could be identified. Therefore, the boundaries of the site extend east to the Platte River, west to I-25, south to the Burlington Northern Rail Road tracks (at approximately 44th Avenue) and north to 58th Avenue in Adams County. In 1998, the Vasquez Boulevard and I-70 Superfund Site (VBI70) was created, bounding the site to the east and west. A Site Index Map is presented in Figure 1.

History of Contamination

The Asarco Globe Plant has been the site of various metal and refining operations since 1886. In that year, the Plant, originally known as the Holden Smelter, began producing gold and silver. In 1901, the American Smelting and Refining Company (renamed Asarco Incorporated in 1975) bought the site, which was then known as the Globe Smelter, and converted the plant to lead smelting. Lead smelting continued until about 1919, when the plant was converted to produce arsenic trioxide. Arsenic trioxide was principally produced from 1919 until 1926. Cadmium production commenced around 1926, using various processes, until 1993. Production of indium began in 1944, and during the 1950's, the Globe Plant produced a variety of high specialty metals including litharge (lead oxide), test lead, bismuth oxide, and occasionally thallium, indium, and some small quantities of high purity metals such as antimony, copper, and tellurium.

In 1974, CDPHE's Water Quality Control Division collected water and sediment samples from the Industrial Drainage Ditch (IDD) located directly west of the plant and detected elevated concentrations of cadmium, arsenic, lead, zinc, and other metals. In 1980 and 1981, CDPHE found the plant to be out of compliance with the Colorado Solid Waste Disposal Sites and Facilities Act. Subsequent to the investigations and inspections conducted by CDPHE, the EPA listed the Asarco Globe Plant on the open dump inventory for 1981 under the Resource Conservation and Recovery Act (RCRA) Section 4000 criteria. Three groundwater monitoring wells were installed at the Plant during this time.

In December 1983, CDPHE sued Asarco for damages to natural resources under CERCLA in State of Colorado v. Asarco, Inc., Civ. No. 83-C-2383, (D. Colo.). After a long legal battle, a Federal Consent Decree between the State of Colorado and Asarco, Inc. was signed on July 15, 1993.

The site was proposed for the Superfund National Priorities List (NPL) on May 10, 1993. The site was divided into four Operable Units: The Former Neutralization Pond, Groundwater and Surface Water, Community Soils and Vegetable Gardens, and the Plant Site.

The Settlement between the United States and Asarco

Due to falling copper prices through the 1990's, Asarco was experiencing financial difficulties and an inability to meet its obligations under a number of consent decrees, administrative orders on consent and unilateral administrative orders throughout the country. As of January 2003, this non-compliance left Asarco exposed to claims for stipulated and statutory penalties in excess of $100 million. In July 2002, Asarco informed the United States of its intention to sell its controlling interest in Southern Peru Copper to its parent company, America's Mining Inc. The United States Department of Justice contended that the original sale price proposed by Asarco was unreasonably low and would have jeopardized Asarco's ability to continue funding environmental remediation. Accordingly, the United States filed suit in U.S. District Court in Arizona and, in January 2003, reached a settlement with Asarco that significantly increased the amount of money Asarco would receive in exchange for its stock.

In addition, the Consent Decree established an environmental trust that now funds environmental cleanup at Asarco sites throughout the country. The money in the trust, however, does not satisfy all of Asarco's response cost obligations. Accordingly, EPA prioritizes sites throughout the country, thereby determining which cleanup efforts will be funded, and the amount they will receive. A shortage of funding from the Trust is the reason for a lack of progress in some of the OUs, such as the remediation of commercial and industrial properties and the Former Neutralization Pond.

3.0 REGULATORY COMPLIANCE

Consistent with Section 121(c) of the CERCLA, as amended, and Section 300.430(f) of the National Contingency Plan (NCP), EPA is performing the Five-Year Review for the Asarco Globe Site (EPA, 1991). EPA determined the level of review based on site-specific considerations, including the nature of the response action, the status of the onsite response activities, proximity to populated areas and sensitive environments, and the interval since the last review was conducted. In most cases, EPA performs a Level I analysis for the Five-Year Review. A Level 1 analysis was previously performed for the Asarco Globe Site. The components of a Level I Five-Year Review, as suggested by EPA guidance (EPA, 1991; EPA, 1994a), include:

- Review of documented operation and maintenance of the site;
- Performance of a site visit;
- Limited analysis of site conditions;
- Review of the administrative record; and
- Review Federal and State environmental laws cited in the ROD to determine if they remain applicable or relevant and appropriate.

3.1 Statutory Review

A statutory five-year review is required at any site where unlimited use and unrestricted exposure, based on ROD cleanup levels, have not been attained (EPA, 1991). A Five-Year Review is required no less than every five years after initiation of the selected remedial action. Future Five-Year Review will be prepared by EPA or upon designation, by CDPHE. Reviews entail a site visit to review the status of the implemented remedy and to determine its protectiveness of human health and the environment. This document presents the results of the 2004 review. The ROD, the Consent Decree (CD), Statement of Work (SOW), Design Investigation Reports (DIRs), Notice of Completion Reports (NOCs), and Monitoring Reports for each Asarco Globe Plant Site Operable Unit were reviewed for this Five-Year Review.

3.2 ARARS

As part of the Five-Year Review, Applicable or Relevant and Appropriate Requirements (ARAR's) were reviewed. The primary purpose of this review was to determine if any newly promulgated or modified requirements of federal or state environmental laws have significantly changed the protectiveness of the remedies implemented at the site. The ARARs reviewed were those included in the Site's original decision documents.

There have been some changes in standards since the ROD pertaining to the Groundwater and Surface Water operable unit. These changes do not affect the protectiveness of the remedy because they apply to aquatic life. Specifically, the South Platte River stream standards for cadmium are:

> (1.128[1n(hardness)]-3.6867) acute for aquatic life uses and
> (.7852[1n(hardness)]-2.715 chronic for aquatic life uses.

In addition, the South Platte River stream standards for zinc are:

> (.8473[1n(hardness)]+0.8618) acute for aquatic life uses and
> (.8473[1n(hardness)]+0.8699 chronic for aquatic life uses if hardness is greater than 200 mg/l.

The Safe Drinking Water Act standard for lead is 0.015 mg/L, as opposed to 0.05 mg/L, as indicated in the ROD. The Safe Drinking Water Act standard for arsenic will be 0.01mg/L as of 01/23/06. These do not affect the protectiveness of the remedy because affected groundwater is not available for beneficial use according to use restrictions imposed by the State Engineer's Office. EPA and CDPHE will continue to monitor this site and any future changes or modifications in ARARs will be reported in the next Five-Year Review.

Because the citations have changed and the regulations have been amended, it is necessary to note that the ARARs include sections 1, 2, and 3, of the regulations pertaining to Solid Waste Disposal Sites and Facilities, 6 CCR 1007-2.

3.3 Environmental Covenant

Because the remedy at the Globe Plant site will not be protective for all uses, Asarco will grant the State an environmental covenant. The purpose of the environmental covenant is to ensure protection of human health and the environment by minimizing the potential for exposure to any hazardous substance, hazardous waste, hazardous constituent, and/or solid waste that remains on the property. By granting the environmental covenant to the State, Asarco will ensure that the State will have enforceability over certain restrictions on the use of the property. For example, because soil remediation levels at the Globe Plant Site are not compatible with the use of the property for residential or agricultural purposes, those uses will be prohibited in perpetuity. In addition, except for remediation purposes, any use or extraction of the groundwater will also be prohibited. If conditions change at the site such that some or all of these uses are appropriate, the owner of the property at the time may request that CDPHE approve a modification or termination of the covenant.

4.0 REMEDIAL ACTIONS

The Asarco Globe Plant Site has been divided into four Operable Units (OUs):

1. The Former Neutralization Pond (FNP)
2. Groundwater and Surface Water
    - Terrace Groundwater
    - Floodplain Groundwater
    - Industrial Drainage Ditch (IDD) and 51st Avenue Retention Ponds
    - Northside Sewage Treatment Plant Pond (NSTP)
    - Localized Floodplain Plume (LFP)
3. Community Soils and Vegetable Gardens
4. The Plant Site
    - Buildings
    - Point Source and Fugitive Air Emissions
    - Surface Soils
    - Former Sedimentation Pond (FSP)
    - Spill and Runoff Control Pond

4.1 The Former Neutralization Pond Operable Unit (FNP)

4.1.1 Location

The FNP is located in the north central portion of the Asarco Globe Plant (see Figure 2).

4.1.2 History

The FNP was originally used for disposal of production related wastewater streams generated at the Plant. In May 1986, use of the pond was discontinued. Since most of the water drained or evaporated, what remained existed as pore water within the precipitate materials. These precipitates, primarily gypsum, contain various metals, including cadmium and arsenic. Samples of the precipitates failed both the Toxic Characteristics Leaching Procedure (TCLP) and Extraction Procedure (EP) toxicity tests for cadmium and arsenic. An interim remedial action was implemented in 1986. At that time, the pond was regraded and capped with six inches of clay soil and revegetated.

Since then, the FNP has been used for disposal of site-related sediments and sludge from the on-site wastewater treatment plant. In 2003, sediments excavated from the Former Sedimentation Pond were added to the FNP. The total surface area covered was approximately 3.4 acres. The placement area was then covered with approximately 4000 cubic yards of clean material, regraded to provide adequate drainage, and will be revegetated during the 2004 season.

4.1.3 Remedial Objectives

The goal of the FNP Remedial Action is to prevent exposure and to prevent or minimize migration of FNP materials into the environment.

4.1.4 Summary of Remedial Action

In the Record of Decision, the preferred alternative for the remedial action at the FNP included in place closure with a slurry wall, a multi-layer cap, maintenance of inward groundwater flow with gravity drain; treatment of collected groundwater; periodic monitoring, and institutional controls. This work is referenced in the Consent Decree's (CD) Statement of Work (SOW), under Section 3.2. The FNP will be closed by:

- Covering the precipitate material with a multi-layer RCRA Subtitle C-equivalent cap to minimize infiltration into, prevent direct contact with, and prevent wind blowing of precipitate materials. The cap is to be designed and constructed in accordance with relevant RCRA Subtitle C cap guidance.
- Installing a slurry wall to limit groundwater flow into, and leachate flow from the precipitate materials, and subsequent metals migration and to further contain the materials by separating the materials from the surrounding environment.

- Installing a drainage system within the slurry wall enclosure to drain groundwater from the slurry wall enclosure, and lower groundwater to elevations below the materials and prevent the generation and migration of leachate from the materials. Groundwater drained from within the slurry wall would then be pumped and treated on site.

Implementation of institutional controls remains a requirement to achieve the protectiveness goals of the remedy. Deed restrictions will denote that the FNP area is a waste disposal site and will include restrictions against excavation into the cover, construction of structures, groundwater use within the slurry wall or outside the wall until MCLs are met, and agricultural use.

The Remedial Action for the Former Neutralization Pond Operable Unit has not been completed at this time. Designs for the FNP remain at the 90% stage. Due to Asarco's financial situation, work on the project has been postponed indefinitely. The State has indicated to EPA that completion of this project should be a priority under the Asarco Environmental Trust and in 2003, CDPHE requested $3.45M over three years from the Asarco Trust for the completion of the project. Funding is not yet available.

4.1.5 Site Visit

The State Project Manager performed a site visit in June 2004. The purpose of the site visit was to assess the protectiveness of the remedy. Institutional controls that are in place include restricted access and prohibitions on the use or disturbance of the area. The FNP is currently covered with clean soil and graded to maintain proper drainage and therefore poses no immediate threat to human health and the environment. No activities were observed that would have violated the institutional controls. The cover and surrounding area were undisturbed. Refer to photographs in Appendix A.

4.1.6 Recommendations

The remedy should be implemented as soon as possible.

4.2 Groundwater and Surface Water Operable Unit

In the Record of Decision, the preferred groundwater remedy is described as a terrace drain system, excavation, and disposal of IDD and Retention Pond sediments, periodic monitoring, institutional controls and contingency for covering Detention Pond sediments. The terrace drain, installed along the length of the Plant terrace, is designed to intercept and collect contaminated groundwater from the terrace; support local extraction of arsenic-contaminated floodplain groundwater near the northeast corner of the Plant as necessary; and support the treatment of collected contaminated groundwater at Asarco's wastewater treatment plant to the performance objectives as shown in Table 1. The remaining floodplain contaminated groundwater would naturally attenuate.

In the Record of Decision, Institutional controls of the groundwater to prevent use of Plant and Floodplain groundwater as long as it remains contaminated included:

- a prohibition on installation of any water supply wells within the contaminated portion of the floodplain
- a requirement that treatment of groundwater continue as long as water remains contaminated.

Table 1: Groundwater Performance Objectives

Arsenic	Cadmium	Zinc
0.05 mg/L	0.005 mg/L	5.0 mg/L

A map illustrating the components of the Groundwater and Surface Water Operable Unit is presented in Figure 3.

4.2.1 Terrace Groundwater

4.2.1.1 Location

The Terrace Drain is on the eastern side of the Plant and is approximately 1,945 feet in length. It is installed near the eastern edge of the terrace portion of the plant. The northern 660 feet of the drain system are installed parallel to and approximately 70 feet west of Washington Street. The northern terminus of the Terrace Drain is approximately 180 feet south of the Plant's northern boundary at 55th Avenue. The southern end of the Terrace Drain is near the Asarco's former Main Office Building in the south central portion of the plant. For approximately 1,000 feet of its length, the alignment of the Terrace Drain is roughly parallel to and directly up gradient of the Farmers and Gardeners Ditch (FGD), which is an irrigation conveyance system that runs from southwest to northeast through the plant. Within the plant, the FGD is enclosed within a 36-inch diameter pipeline.

4.2.1.2 History

Shallow groundwater on the terrace contained concentrations of cadmium, arsenic, and zinc in excess of the Federal Primary and Secondary Drinking Water Standards. Sources of the elevated metals concentrations include the FNP, fill material and deposits in the former neutralization pond, spent electrolyte solutions near the FNP, and possible wet operations from the surrounding buildings.

4.2.1.3 Remedial Objectives

The goals of the Terrace Groundwater Remedial Action are to prevent or minimize the flow of groundwater containing concentrations in excess of 0.005 mg/l cadmium, 0.05 mg/l arsenic, and 0.5 mg/l zinc, from the terrace portion of

the Plant to the floodplain and resulting impacts to the floodplain aquifer, and to prevent or minimize impact to the IDD and FGD.

4.2.1.4 Summary of Remedial Action

The Terrace Drain intercepts groundwater by extending from the ground surface into the underlying upper claystone material of the Denver Formation (approximately 20-35 feet below the ground surface). It conveys the intercepted groundwater through a high-permeability, gravel collection system, into a perforated drainage pipe to two sumps. From these sumps, it is pumped to the Plant's onsite Waste Water Treatment Plant (WWTP). Approximately 14,000 gallons per day are extracted and sent to the WWTP. Once treated, the intercepted groundwater is discharged into the City and County of Denver sanitary sewer system in accordance with Asarco's Conditional Wastewater Discharge Permit with the Metropolitan Wastewater Reclamation District.

Asarco submitted a Notice of Completion Report in February 2001. CDPHE's approval letter was issued May 14, 2001. The SOW requires the monitoring and evaluation of cadmium, arsenic, and zinc concentrations in the groundwater of the floodplain aquifer. Concentrations of these metals should decrease over time due in part to the installation of the terrace drain. At present, based on estimates of time needed for concentrations reductions in floodplain groundwater, insufficient time has elapsed since the drain's installation to expect observable reductions. Two monitoring wells GW-77 and GW-78 are expected to exhibit concentrations reductions during the next ten years (in 2004 and 2007, respectively). Because of Asarco's tenuous financial situation and the availability of funds from the National Trust for use at the Globe Site, Asarco has not yet submitted the 2003 Annual Monitoring Report. Asarco is in the process of compiling those data and will submit the report to CDPHE in the near future. However, for the purposes of this report, the most recent complete set of monitoring data as of August 2004 is the 2002 Annual Monitoring Report. CDPHE has been able to obtain some 2003 data preliminarily and has included them where possible.

Concentration maps of arsenic and cadmium levels in terrace groundwater were prepared for the 2003 Annual Monitoring Report and are included in Appendix B. The concentrations reported and the contour patterns developed appear to be typical of historic conditions.

4.2.1.5 Site Visit

Because the Terrace Drain is underground, it could not be visually observed when the site inspection took place on July 6. However, the State Project Manager conducted an interview with Asarco's Environmental Services Manager. It was reported that the Terrace Drain was in good condition and operating effectively. Please refer to Appendix A for a photograph of the frac tank used in the treatment process. The treatment plant was observed and is operating effectively, actively treating approximately 14,000 gallons of groundwater daily.

4.2.1.6 Recommendations

Floodplain groundwater should be monitored quarterly to assess the effectiveness of the remedy. A decrease in arsenic and cadmium levels should be observed after the passage of sufficient time as addressed in the Floodplain Monitoring Plan.

Funding for the Wastewater Treatment Plant is subject to the requirements of the Asarco National Trust. In 2003, CDPHE requested $250,000 annually over the next three years (FY04-06) to assure continuous operation of the treatment system. The funding was allocated as requested for FY04.

A Notice of Completion was submitted on 02/27/01 and accepted by CDPHE on 05/14/01 for the Terrace Drain portion of the Groundwater and Surface Water Operable Unit. It should be evaluated in the next 5-year review.

4.2.2 Floodplain Groundwater

4.2.2.1 Location

Shallow groundwater flows southeastward from the terrace and enters the floodplain aquifer of the South Platte River. Upon entering the floodplain, the direction of groundwater flow bends sharply to the northeast and flows approximately 8000 feet before entering the South Platte River.

4.2.2.2 History

In 1993, floodplain deposits within and beyond the Plant's eastern boundary exceeded the Federal Primary and Secondary Drinking Water Standards for concentrations of cadmium, zinc, and arsenic. Beyond the localized floodplain plume, zinc concentrations were below the Performance Objective of 5.0 mg/l. Concentrations of cadmium and arsenic in the floodplain aquifer were one to two orders of magnitude lower than in the terrace groundwater, but remained above Performance Objectives of 0.005 mg/L and 0.05 mg/L, respectively.

4.2.2.3 Remedial Objectives

The goals of the Floodplain Groundwater Remedial Action are:

- to prevent domestic or irrigation use and human exposure, through natural attenuation, implementation of the terrace drain, and operation of the wastewater treatment plant, groundwater concentrations of cadmium, arsenic, or zinc to levels below 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L respectively, or background levels not attributable to the Asarco Globe Plant, whichever are higher, in the floodplain by 2093

- to prevent or minimize further degradation of the floodplain groundwater due to the discharge of groundwater exceeding performance objectives while restoration takes place.

4.2.2.4 Summary of Remedial Action

The groundwater remedial action includes two components: 1) a comprehensive groundwater use survey, 2) and a quarterly monitoring program for the floodplain aquifer that includes annual evaluation of concentrations of cadmium, arsenic, and zinc. In December 1995, Asarco completed the water use survey, which identified 23 wells of which six remained in service (three for irrigation, two for industrial use, and one for fire control). The remaining 17 were classified "out of service". The State Engineer's records indicate that except for monitoring wells, no new applications for well permits were filed as of December 2002.

While concentrations of cadmium, arsenic, and zinc in the floodplain down gradient of the Asarco Globe Plant should gradually decrease with time, annual monitoring is not expected to detect concentration reductions until 2004 and 2007 in wells GW-77 and GW-78, respectively. Installation of the Terrace Drain (see 4.2.1 above) should positively influence this outcome. Routine quarterly, semi-annual, and annual floodplain monitoring is conducted in accordance with Section 7.5 of the SOW. Results are submitted to CDPHE electronically.

4.2.2.5 Site Visit

Site visit was performed on July 6, 2004. During that visit, the State project Manager interviewed Asarco's Environmental Services Manager. At that time, all monitoring wells were reported in good condition and the monitoring program was being implemented as required under the Consent Decree.

4.2.2.6 Recommendations

Continue monitoring of groundwater and funding for continuous operation of Asarco Globe Plant Wastewater Treatment Plant.

4.2.3 Industrial Drainage Ditch (IDD) and 51st Avenue Retention Ponds

4.2.3.1 Location

The IDD generally parallels the western boundary of the Asarco Globe Plant. It originates as an open ditch collecting runoff in an industrial area west of Interstate 25 and flows under the highway in a buried concrete pipe. It then flows as an open ditch along the west side of the Globe Plant to 51st Avenue, where it discharges to the 51st Avenue Retention Ponds. Water from the Retention Ponds flows into the 51st Avenue storm sewer, then into a concrete lined channel to the former North Side Sewage Treatment Plant (NSTP) property and then into the

Detention Pond. Overflow from the Detention Ponds flows by buried concrete pipe to the South Platte River.

4.2.3.2 History

The IDD and 51st Avenue Retention Ponds were constructed to manage storm water and are operated by the City and County of Denver within an easement from the Burlington Northern Railroad. An interceptor trench was excavated on the Plant in 1974 to prevent runoff from the vicinity of the FNP from entering the IDD. The Interceptor Trench was designed to stop groundwater from leaving the site at times of the year when the IDD is gaining. Water is extracted from the Interceptor Trench at a rate of approximately 1,000 gallons per day and treated at the Wastewater Treatment Plant. Because soil berms along the perimeter of the Plant prevent runoff from entering the IDD, the Interceptor Trench is no longer necessary.

4.2.3.3 Remedial Objectives

The goal of the IDD and Retention Ponds Remedial Action is to prevent or minimize metals migration from the Plant to the IDD and Retention Ponds water and sediments. The proposed Remedial Objectives, referenced in the SOW, under paragraph 4.3.2 were as follows:

- Ditch sediments with metals concentrations exceeding community soils action levels (>70 parts per million (ppm) for As, >73ppm for Cd, and >500 ppm for Pb), will be removed from the IDD and Retention Ponds.
- The IDD and Retention Ponds will be restored to their previous retention and flow capacities (or greater) through grading and establishment of vegetation as necessary to control erosion.
- The Interceptor Trench will be excavated of sediments down to unweathered claystone and then backfilled. A gravel pipe drain will be installed in the backfill in the event that pumping from the Interceptor Trench drain is necessary to prevent groundwater from entering the IDD.

Community soils action levels are used to determine the need for removal of IDD ditch sediments. The action level of 500 ppm lead is above the currently recommended default action level of 400 ppm lead in soil. Because IDD and retention ponds will be graded and re-vegetated, having sediments left in place at concentrations of up to 500 ppm versus 400 ppm is not likely to have a significant impact on surface water or groundwater concentrations. On-going monitoring will confirm this.

4.2.3.4 Summary of Remedial Action

Sediments were removed from the IDD and Retention Ponds and their previous capacities were restored in the fall of 1997. The Interceptor trench had its

sediments removed and subsequently backfilled with a gravel and pipe drain system in the fall of 1996. The groundwater objectives are being monitored and a further determination of any contingencies is subject to the completion of the FNP cap and slurry wall installation.

The Notice of Completion Report for the IDD, 51st Avenue Retention Ponds and the Interceptor Trench was conditionally accepted by CDPHE in a letter dated December 11, 1998. The following performance monitoring activities were initiated in January 1999:

- Quarterly monitoring of total and dissolved metals concentrations in surface water
- Annual monitoring of total metals concentrations in sediment
- Quarterly monitoring of water levels and collection of groundwater samples in monitor wells adjacent to the IDD
- Quarterly monitoring of dissolved metals concentrations in groundwater down gradient from the IDD.

Surface Water Conditions
Four surface water samples were collected in 2002 and analyzed for total and dissolved arsenic, cadmium and zinc. Total and dissolved arsenic and zinc concentrations did not exceed the respective 0.05 and 5.0 mg/L performance criteria at any of the four monitoring locations. However, cadmium concentrations in excess of 0.005 mg/L were observed at one location for three of four sampling events. In addition, total cadmium concentrations in excess of 0.005 mg/L were observed at one location all four events and at two other locations during the second and fourth quarter events.

Sediment Conditions
In 2001 and 2002, several sediment samples from the upper portion of the IDD were reported to contain arsenic and cadmium in excess of the performance criteria (community soils action levels). Asarco is currently evaluating the efficacy of in-situ bioremediation for control of metal solubility in these sediments.

Groundwater conditions
Since the third quarter of 2001, there have been several exceedances of the performance criteria in the rolling averages for dissolved arsenic, cadmium, and zinc (0.05, 0.005, and 5.0 mg/L respectively). Because seasonal fluctuations appear to be affecting the concentrations over time and because the IDD itself is under evaluation, Asarco proceeded to evaluate the apparent seasonal nature of the data with further quarterly monitoring.

4.2.3.5 Site Visit

Site visit was performed on July 6, 2004. During that visit, the State Project Manager interviewed Asarco's Environmental Services Manager. At that time, all monitoring wells were reported in good condition and the monitoring program was being implemented as required under the Consent Decree.

4.2.3.6 Recommendations

Quarterly monitoring should continue. The Wastewater Treatment Plant should remain operational to assure treatment of water extracted from the Interceptor Trench. A Notice of Completion submitted to CDPHE on 11/01/1998. CDPHE issued a "conditional" acceptance 12/11/1998 because Asarco could not demonstrate that wetlands had been established at the site as required under the statement of work. Asarco should document and submit evidence of the wetlands to CDPHE as soon as possible. The IDD and Retention Ponds portion of the Groundwater and Surface Water Operable Unit should be retained for the next 5-year review.

4.2.4 Northside Sewage Treatment Plant Detention Pond

4.2.4.1 Location

The Northside Sewage Treatment Plant (NSTP) Detention Pond is along the path of surface flow from the IDD to the South Platte River. Because the IDD received groundwater from the Asarco Globe Plant, as well as surface water and groundwater from the large urban area surrounding and upstream of the Globe Plant, the sediments within the Detention Pond had elevated levels of metals and organics.

4.2.4.2 History

The Industrial Drainage Ditch originates as an open ditch collecting runoff in an industrial area west of I-25 and flows under the highway in a buried concrete pipe. It then flows as an open ditch along the west side of the Plant to 51st Avenue where it discharges to the 51st Avenue Retention Ponds. Water from the retention ponds flows ease to Washington Street, south to 50th Avenue and east along 50th Avenue too a concrete lined open channel on the former NSTP property. Water in the concrete lined channel flows north to the NSTP Detention Pond excavated in the floodplain deposits. The organic contaminants, principally petroleum compounds, are from unknown sources.

4.2.4.3 Remedial Objectives

The remedial objective of the NSTP Detention Pond Remedial Action is to prevent or minimize direct contact with NSTP Detention Pond Sediments that have metals contamination above Community Soils Action Levels.
(refer to Table 2 section 4.3).

4.2.4.4 Summary of Remedial Action

Sediments in the Detention Pond are perennially covered with water, are not exposed, and do not pose a risk to human health. Therefore, no action was required. If, however, the Detention Pond sediments with metals above the community soils action levels become exposed for two months and continued exposure appears likely, Asarco will cover the area with 12 inches of clean soil, or excavate and dispose of the exposed sediments. If excavated, soils will be tested for hazardous waste characteristics and managed appropriately. No exposed sediments were observed during monthly inspections conducted by Asarco in 2002.

4.2.4.5 Site Visit

A site visit was conducted on July 7, 2004. The pond was full of water at that time and no sediments were exposed. Asarco's Environmental Services Manager reported in an interview that no significant issues had been identified regarding the area and that Asarco has met the monitoring requirements successfully in the past five years.

4.2.4.6 Recommendations

Annual monitoring of the area should continue especially considering the drought conditions experienced in the Denver area over the past several year.

4.2.5 Localized Floodplain Plume

4.2.5.1 Location

Within the floodplain deposits and beyond the Plant's eastern boundary, concentrations of cadmium, zinc, and arsenic exceeded the Federal Primary and Secondary Drinking Water Standards. This included a localized area of groundwater east of the Asarco Globe Plant boundary in the floodplain area near GW-64 where concentrations of the metals of concern were significantly higher than the concentrations throughout the majority of the floodplain plume.

4.2.5.2 History

Before the installation of the terrace drain, shallow groundwater with elevated concentrations of arsenic, cadmium, and zinc flowed in an east-southeast direction off the terrace and into the floodplain aquifer producing the localized floodplain plume. Upon entering the floodplain, the direction of groundwater flow bends sharply to the northeast and flows approximately 8,000 feet before entering the South Platte River.

Water levels recorded during the first quarter of 2,000, about one year after the terrace drain became operational, indicate that the groundwater up gradient of the terrace drain flows southeast, and is captured by the drain. Groundwater immediately east and down gradient of the north portion of the terrace drain flows almost due south.

4.2.5.3 Remedial Objectives

The goal of the Localized Floodplain Plume Remedial action is to prevent domestic irrigation use and human exposure to concentrations of cadmium, arsenic, or zinc in excess of 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L, respectively. Concentration contours of arsenic and cadmium are included on Figure 3. The concentrations reported in the 2002 Performance Evaluation Report (December 2003) and the contour patterns developed appear to be typical of historic conditions.

4.2.5.4 Summary of Remedial Action

In accordance with Section 4.5.2 of the SOW and the Localized Floodplain Plume Design Investigation Plan, a Design Investigation was conducted for the LFP following implementation of the terrace drain remedy. A Design Investigation Report was submitted to CDPHE for that work in April 5, 2002. The DIR concluded that the terrace drain has been effective in reducing metals concentration in groundwater of the LFP, and that metals concentrations in groundwater should continue to decrease over time. The DIR also concluded that separate remedial action to address groundwater metals concentrations in LFP does not appear to be necessary. The Colorado State Engineer under Colorado water rights, which restrict beneficial use of the shallow aquifer, enforces institutional Controls restricting access.

4.2.5.5 Site Visit

Wells referred to in the text are maintained in good condition and remain part of the ongoing monitoring program. Site visit was performed on July 6, 2004. During that visit, the State Project Manager interviewed Asarco's Environmental Services Manager. At that time, all monitoring wells were reported in good condition and the monitoring program was being implemented as required under the Consent Decree.

4.2.5.6 Recommendations

Groundwater monitoring in LFP wells GW-64, GW-84, GW-86R and GW-94 should be continued to assess changes in metals concentrations over time. Refer to Figure 3.

4.3 Community Soils and Vegetable Gardens Operable Unit

4.3.1 Location

The Community Soils and Gardens Operable Unit is described as any property within or generally adjacent to the Globe Globe Plant (see Figure 4), where metals concentrations in soils exceed any of the community soils action levels shown in Table 2 below. The actual extent of the remediation area was based on testing of each property. The area includes both residential and commercial/industrial properties.

4.3.2 History

When the Asarco Globe Plant was built in 1886, the surrounding area was considered rural. The residential area grew up as a company town housing project for smelter workers from around the world. Homes date from the late 1800s.

Today the site is within the Denver urban corridor that straddles the South Platte River Valley and has become a major transportation and industrial corridor. Now, where two major interstate highways (I-25 and I-70) intersect, the Globe Plant and its surrounding neighborhood are at the core of a mixture of residential, commercial, and industrial land use.

4.3.3 Remedial Objectives

The goal of the Community Soils And Vegetable Gardens Remedial Action is to prevent or minimize exposure to soils and vegetables grown in soils with concentrations of metals exceeding the health-based action levels. Properties that exceed action levels were identified through a property-by-property sampling and testing program. The risk based primary action levels are summarized in Table 2.

Table 2: Soils Metals Action Levels Community Soils

Metal	Residential (ppm)	Commercial/Industrial (ppm)
Arsenic (As)	>70	>70
Cadmium (Cd)	>73	>73
Lead (Pb)	>500	>1460
Zinc (Zn)	>500	>500

A Medical Monitoring Program was included as a part of the remedy for Community Soils. The program was designed to provide an assessment of individual health status and adverse health effects that may have occurred because of historical exposure to cadmium, arsenic, and lead related to the Asarco Globe Plant, or that may have occurred due to site remediation. It was provided for residents who currently live near or have previously lived near the Globe Plant.

4.3.4 Summary of Remedial Action

Remediation of contaminated soils is by one of three methods referenced in the SOW, paragraph 5.2.1: 1) Removal of a foot of soil and replace with a foot of clean soil; 2) cap with a foot of clean soil; or, 3) deep tilling. In general, the order in which remediation took place was 1) schools and parks; 2) required residential areas; and 3) commercial areas. The remedy included dissemination of public information and education as well as a medical monitoring program.

As of the fall of 2002, all residential properties (approximately 700) in the area immediately surrounding the Asarco Globe Plant and those not incorporated into the Vasquez Boulevard and I-70 Superfund Site that exceed the State Action levels as defined in Table 2 above, have been remediated.

A number of commercial and industrial properties have not been sampled and a number have been sampled but not remediated. Because of Asarco's financial situation, a national trust fund has been established to assure Asarco's ability to address environmental liability. CDPHE has requested funding for that project from the Asarco Trust ($3,500,000 over three years, FY04-06) for the past two years. None has yet been allocated.

In 2002, the State and Asarco filed a "Notice of Joint Modification of Statement of Work and Medical Monitoring Program" with the United States District Court for the District of Colorado. At that time, the commercial/industrial action level for lead was changed from 500 ppm to 1460 ppm, which is consistent with the Hazardous Materials and Waste Management Division's Proposed Soil Remediation Objective Policy. It was hoped that by reducing the number of commercial/industrial properties that require remediation for lead, Asarco could redirect available funds to the residential cleanup while still providing a protective cleanup for those commercial/industrial properties that are significantly impacted.

The Medical Monitoring Program evaluated "recent" exposure to lead, arsenic, and cadmium, which is both before and during soil remediation activities. An updated cancer cluster survey was performed to evaluate long-term carcinogenic effects from exposure to both arsenic and cadmium. In addition to health education, the program offered individual follow-up by a program physician. Medical Monitoring was offered throughout the duration of community soil remediation. Since the program began in 1994, over 1,500 individuals have participated in the program. CDPHE has not seen community –wide evidence of health effects due to exposure to heavy metals originating from the Asarco Globe Plant.

In 2002, the State and Asarco filed a "Notice of Joint Modification of Statement of Work and Medical Monitoring Program" with the United States District Court for the District of Colorado. At that time, the Medical Monitoring program was scheduled to end when all residential properties with soils above the action levels in the South Globeville have

been remediated. This occurred in the fall of 2002. A Final Medical Monitoring Report is being prepared and will be issued by the end of 2004.

4.3.5 Site Visit

The State Project Manager conducted a site visit on July 7, 2004. Because Notice all residential properties in the area identified as Community Soils and Vegetable Gardens operable Unit on Figure that exceeded state action levels have been remediated, no inspection was necessary.

4.3.6 Recommendations

The Final Report for the Globeville Medical Monitoring Program will be completed and made available for public review.

Sampling and remediation of qualifying commercial/industrial properties should commence as soon as possible. Community Soils and Gardens Operable Unit should be retained for the next 5-year review.

4.4 Plant Site Operable Unit

The Asarco Globe Plant, bounded by East 51st Avenue on the south, the Industrial Drainage Ditch on the west, East 56th Avenue on the north, and Washington Street on the east, encompasses approximately 78 acres. See Figure 5.

In the Record of Decision, the preferred alternative for the Plant included:

- air pollution source controls and fugitive emissions and dust controls
- emissions cap of 162 kilograms cadmium per year
- excavation, covering, deep tilling, or exposure controls for Plant soils above worker/trespasser action levels
- excavation and stabilization of sediments
- sealing of floors and sumps as necessary
- secondary containment in Plant sumps
- spill control of retention pond.

The recommended institutional controls include restrictions for future use of the Asarco Globe Plant property to industrial land use that requires similar or more restrictive exposure levels and proper maintenance of vegetative cover and erosion control. In addition, controls will be implemented to maintain restrictions on Plant property where excavated community soils have been placed.

4.4.1 Buildings

4.4.1.1 Location

The buildings are located on the 78 acres at the Asarco Globe Plant, which is located as described in Section 4.4 above.

4.4.1.2 History

The Asarco Globe Plant includes 53 current and former manufacturing and support buildings used for production, offices, and wastewater treatment.

4.4.1.3 Remedial Objectives

The goals of the Remedial Action for the Asarco Globe Plant Buildings are to:

- prevent or minimize leaching of metals from buildings and sumps that result in concentrations of cadmium, arsenic or zinc that exceed 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L respectively
- prevent or minimize leaching of metals from sources below buildings that result in concentrations of cadmium, arsenic or zinc that exceed 0.005 mg/L, 0.05 mg/L, and 5.0 mg/L respectively.

4.4.1.4 Summary of Remedial Action

Because large-scale operations were discontinued at approximately the same time as the signing of the Decision Documents, the risk of release from any of the buildings was minimized. The Asarco Globe Plant buildings and associated drive, parking areas and concrete pads covers about one-fourth of the Plant surface area and serve as a stable interim status, reducing the possibility of exposure to workers and trespassers.

4.4.1.5 Site Visit

The State Project Manager performed a site visit on July 6, 2004. The Asarco Globe Plant was observed to be in very good condition. No debris or hazards were observed. The asphalt and concrete is in good condition. The buildings are in good repair. The institutional controls that are in place include restricted access to the property, which is fenced. The condition of the fence is monitored and reported annually to CDPHE.

4.4.1.6 Recommendations

Should the property be redeveloped, issues will arise that will require coordination with CDPHE to assure that any future use is consistent with the remedy. Care must be taken to prevent or minimize exposure to contaminated soils during demolition and excavation activities. This portion of the Plant Site Operable Unit should be retained for the next 5-year review.

4.4.2 Point Source and Fugitive Air Emissions

4.4.2.1 Location

The remedy applies to operations at the Asarco Globe Plant, which is located as described in Section 4.4 above.

4.4.2.2 History

The history of smelting activities at the Asarco Globe Plant is extensive. Lead smelting occurred between 1901 and 1919. In 1919, Globe changed its production to arsenic trioxide until 1926 when it converted to cadmium production. Large-scale cadmium production ceased in 1991, however, cadmium oxide and cadmium powder production continued until 1993, the same year the Record of Decision was signed. Production of indium began in 1944 and during the 1950s, the Asarco Globe Plant currently produces a variety of high purity and specialty metals.

4.4.2.3 Remedial Objectives

The goals of the point source and Fugitive Air Emissions Remedial Action were to minimize point source and fugitive emissions of cadmium and arsenic from the Asarco Globe Plant and to reduce human health risk due to cadmium and arsenic emissions from the Plant to health protective levels.

4.4.2.4 Summary of Remedial Action

The remedy consisted of controls for an industrial-scale cadmium refining process. However, after the Record of Decision was issued in 1993, this operation was discontinued.

Ambient Air Monitoring is conducted at four existing monitoring high-volume stations near the Plant boundaries on at least a once every six days, twenty-four hour period frequency. The High volume filter will be analyzed for TSP, cadmium, arsenic, and lead during each test period. In addition, at least one of the TSP stations will be modified to include a co-located PM10 monitor. The meteorological station on the Plant will collect continuous wind speed, wind direction, temperature, relative humidity, and barometric pressure data. Quarterly reports are provided to CDPHE for review.

The Asarco Globe Plant continues to operate other specialty metals processes. Information recently submitted to the Air Quality Division of CDPHE indicates that emissions from the new processes are within the cancer and non-cancer risk levels proscribed by the remedy.

4.4.2.5 Site Visit

The State Project Manager conducted a site visit on July 7, 2004. Air monitoring is ongoing at the plant site. Several air monitoring stations were observed. Refer to photos in Appendix A.

4.4.2.6 Recommendations

All future processes at the Asarco Globe Plant must comply with applicable state and federal ambient air quality standards.

4.4.3 Surface Soils

4.4.3.1 Location

All surface soils at the Asarco Globe Plant bounded by East 51st Avenue on the south, the Industrial Drainage Ditch on the west, East 56th Avenue on the north, and Washington Street on the east.

4.4.3.2 History

Cadmium, arsenic, lead, and zinc concentrations are elevated in the upper 24 inches of site soils because of historical smelter operations.

4.4.3.3 Remedial Objectives

The goals of the Asarco Globe Plant Surface Soils are to:

- prevent or minimize exposure of community residents exposures to windblown soils from the Plant with concentrations that exceed community soils action levels by vegetation or by covering with asphalt, buildings or other barriers that minimize the potential for exposure to windblown soils
- prevent or minimize migration of cadmium, arsenic, lead, or zinc from Plant shallow soils with concentrations that exceed community soils action levels to surface water and groundwater
- prevent or minimize exposure to trespassers or workers to soils with metals concentrations exceeding health-based action levels for cadmium, arsenic or lead above 9125 ppm, 426 ppm, and 3,000 ppm, respectively
- Maintain a continuous fence around the Plant property so that the Plant is only accessible to Plant workers and authorized visitors.

4.4.3.4 Summary of Remedial Action

Surface soils at the Asarco Globe Plant that exceed the worker/trespasser action levels (cadmium, arsenic or lead above 9,125 ppm, 426 ppm, and 3,000 ppm

respectively) will be remediated by capping or deep tilling to prevent exposure of workers or trespassers to these concentrations. Capping consists of 12 inches of borrow soils (including excavated community soils with metals concentrations below the worker/trespasser action levels) or two inches of asphalt or other durable cover (hardscaping) placed over these soils. Deep tilling will be allowed where tilling will mix the soils such that the overall concentration is brought below the worker/trespasser action level for each metal. For all capped areas that are not paved or covered with gravel, a vegetative cover will be established that has sufficient diversity to ensure long-term viability and sufficient density to prevent erosion that may impair the integrity of the soil cap.

Surface soils that exceed the community soil action levels in the upper six inches but are less than the worker/trespasser action levels, are remediated by providing a vegetative cover that is sufficient to endure long term viability and prevent erosion or, by placing a minimum of 12 inches of borrow soils meeting specifications approved by CDPHE (including excavated community soils with metals concentrations below the worker/trespasser action levels) over the soils, or by placing a two inch asphalt cover. All slopes with soils that exceed community soils action levels will be stable and erosion resistant. The top one foot will remain uncompacted for establishment of vegetation.

Where soils are placed on the Asarco Globe Plant, the resulting topography will blend with the natural landscape, be of stable configuration, create positive stable drainages, and have vegetative covers sufficient to ensure long-term viability and prevent erosion.

To the extent possible, excavated community soils placed on the Plant must not be characteristically hazardous based on the upper 90% confidence limits for the correlations between the Toxicity Characteristic Leaching Procedure (TCLP) results and the total metal concentrations and meet the technical requirements of a Solid Waste Certificate of Designation (no degradation of groundwater, surface water, or air quality).

After areas exceeding worker/trespasser action levels and the lead slag pile are covered, placement of excavated community soils will continue from areas with higher concentrations of metals to areas of lower concentrations. Soils with metals concentrations greater than the worker/trespasser action levels or that are Resource Conservation Recovery Act (RCRA) characteristic, will be managed in a manner meeting all applicable off-site regulations or applicable or relevant and appropriate requirements if managed on-site.

After the completion of the Residential portion of the Community Soils and Garden's Operable Unit, which included the placement of those soils on the Globe Plant site, Community Soils covered approximately 30% of the Asarco Globe Plant. In 2002, because areas needing cover remained, EPA began placing soils removed from residential properties at Operable Unit 1 (OU1) of the

Vasquez Boulevard and I-70 (VBI70) Superfund site on the Plant to continue covering areas not yet covered with Globeville community soils. Placement of the VBI70 soils is consistent with the remedy design agreed to by the State and Asarco in the Statement of Work of the Consent Decree for the Asarco Globe Plant and as stated in Section 1.3.1 of the Globe Plant Soils Preliminary Design Report (February 22, 1994). Soil Placement will likely continue until the VBI70 project has been completed. Reduction of contaminant levels in the surface soils will facilitate future development of the property.

This Remedial Action is an ongoing effort and has become part of regular maintenance at the Globe Plant. This includes keeping drainage ways free of debris and in good repair, monitoring for erosion and providing erosion control. The Community Soils placement activities are conducted to improve the drainage on the Plant. Currently a berm runs the length of Washington Street on the west side and prevents any runoff from reaching the City and County of Denver right of way. In addition, upgrades have been performed with funds from the Natural Resource Damage Suit. This includes planting of several hundred trees and shrubs that will provide protective cover, erosion control, as well as serve as a visual barrier to the Asarco Globe Plant.

4.4.3.5 Site Visit

On July 6, 2004, the State Project Manager conducted a site visit. At that time, EPA's placement of soils on the Asarco Globe Plant was proceeding in accordance with the terms agreed to among Asarco, EPA, and the State. All culverts and drainage ways are designed and maintained such that surface water remains on the Asarco Globe Plant and either evaporates or filters into groundwater where it is subject to monitoring under the Groundwater and Surface Water Operable Unit.

4.4.3.6 Recommendations

Continue placement of community soils in accordance with the requirements of the SOW. Establish and maintain a vegetative cover on the soils to address dust issues and erosion concerns expressed by members of the community and to comply with the Plan Site Soils Preliminary Design Report (February 1994). The Surface Soils portion of the Plant Site Operable Unit should be retained for the next 5-year review.

4.4.4 Sedimentation Pond

4.4.4.1 Location

A small pond, approximately 50 feet in diameter, is located in the northeast corner of the Plant. This pond trapped sediments in surface water runoff from the northern portion of the Plant.

4.4.4.2 History

The pond was taken out of service in the early 1980s by filling it with building demolition material, regrading the area to a relatively smooth surface, and covering sediments in the pond with a thin clay cap. Total metal concentrations in sediments located below the groundwater table were elevated with arsenic concentrations as high as 6,125 ppm. These saturated sediments were a source of arsenic contamination in shallow groundwater.

4.4.4.3 Remedial Objectives

Remedial Objectives for the Sedimentation Pond are to prevent or minimize leaching of arsenic, cadmium, lead, and zinc into shallow groundwater and to prevent or minimize exposure of worker/trespassers to contaminated surface soils.

4.4.4.4 Summary of Remedial Action

In late 2003, materials contained within the sedimentation pond were excavated, placed on the Former Neutralization Pond, and covered with approximately 4,000 cubic yards of clean fill material.

4.4.4.5 Site Visit

The State Project Manager conducted a site visit on July 7, 2004. The location of the sedimentation pond has been re-graded to achieve stable configuration and create positive stable drainage. A vegetative cover will be established to ensure long-term viability and prevent erosion. Please refer to photographs in Appendix A.

4.4.4.6 Recommendations

Establish and maintain a vegetative cover on the area. CDPHE accepted a Notice of Completion for the Former Sedimentation Pond portion of the Plant Site Operable Unit. The Former Sedimentation Pond portion of the Plant Site Operable Unit should be retained for the next 5-year review.

4.4.5 Spill and Runoff Control Pond

4.4.5.1 Location

The remedy applies to surface runoff from active areas of the Plant that could contain elevated concentrations of metals. The Asarco Globe Plant is located as described in Section 4.4 above.

4.4.5.2 History

The Asarco Globe Plant includes several ponds, basins, and drainage pathways that historically carried runoff and process waters off the Plant.

4.4.5.3 Remedial Objectives

The goal of the Spill and Runoff Control Pond Remedial Action is to prevent or minimize any surface runoff from active areas of the Asarco Globe Plant that may contain elevated metals from entering other areas of the Plant or from leaving the Plant.

4.4.5.4 Summary of Remedial Action

Because large-scale operations were discontinued at approximately the same time as the signing of the Decision Documents, the risk of spills was minimized.

4.4.5.5 Site Visit

The State Project Manager performed a site visit on July 6, 2004. It was observed that drainage was being maintained across the site according to the requirements of the Consent Decree. No specific areas of concern were identified.

4.4.5.6 Recommendations

Should the property be redeveloped, issues will arise that will require coordination and care to assure that any future use is consistent with the goals of the remedy. This portion of the Plant Site Operable Unit should be retained for the next 5-year review.

5.0 ASSESSMENT

Former Neutralization Pond Operable Unit

Question A: Is the remedy functioning as intended by the decision documents?

In the Record of Decision (ROD) issued February 18, 1993, the preferred alternative is described as "in-place closure with a slurry wall, multi-layer cap, maintenance of inward groundwater flow with gravity drain; treatment of collected groundwater; periodic monitoring and institutional controls." The review of documents, ARARs, and risk assumptions indicate that the completion of the remedy as planned or some variation there of, would still result in a remedy that is protective of human health and the environment. Because the remedy is not yet in place, it is not yet functioning as intended.

Question B: Are the Assumptions made at the time of the remedy selection still valid?

Yes, the assumptions made at the time of remedy selection remain valid. Capping of the materials will prevent direct human contact with the materials and wind blowing of particles. The cap will also provide long-term protection against surface water contacting materials. The composite cap will also prevent and/or minimize infiltration of precipitation into the contents and minimize leachate production and subsequent migration into groundwater. Further, the slurry wall and groundwater drain will prevent migration of contaminants into the surrounding groundwater. Once this is in place, it will minimize the maintenance requirement on the Terrace Drain extraction system as well. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy as described in the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

It is possible that in the ten years since the initial description of the remedy that new technologies may have been developed that would improve or enhance the remedy and improve its performance. When it comes time to implement the remedy, any such technologies or changes to the original conceptual design should be considered. Further, redevelopment opportunities may have some bearing on the ultimate remedy design and implementation. In any event, no information has been identified that would call into question the protectiveness of the remedy as described once implemented.

Groundwater and Surface Water Operable Unit

Question A: Is the remedy functioning as intended by the decision documents?

In the Record of Decision, the groundwater remedy is described as a terrace drain system; excavation and disposal of IDD and Retention Pond sediments; periodic monitoring, institutional controls, and contingency for covering Detention Pond sediments; a terrace

drain, installed along the length of the Asarco Globe Plant Terrace to intercept and collect contaminated groundwater from the terrace; local extraction of arsenic-contaminated floodplain groundwater near the northeast corner of the Plant as necessary; and treatment of collected contaminated groundwater at Asarco's wastewater treatment plant; natural attenuation; and institutional controls.

All the components of the remedy have been installed and appear to be operating as intended. However, cadmium and zinc levels in surface water and arsenic, cadmium and zinc in groundwater exceed Performance Criteria at the IDD and 51st Avenue Retention Ponds indicate an ongoing source of contaminants and a continued exposure pathway. Several years of continued monitoring will be necessary to evaluate whether the remedy is operating effectively. Additional monitoring information should be evaluated at the time of the next 5-year review.

Question B: Are the Assumptions made at the time of the remedy selection still valid?

The assumptions made at the time of the remedy selection remain valid. No changes in risk assessment methodologies have been noted.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy

The Performance Objective for the allowable concentration of arsenic in groundwater is 50 ug/L, which is above the currently promulgated MCL of 10 ug/L. Therefore, this Performance Objective would not currently be considered protective for a drinking water source. Exceedance of the performance objectives reported in the 2002 Annual Monitoring Report call into question the protectiveness of the remedy.

Community Soils and Vegetable Gardens Operable Unit

Question A: Is the remedy functioning as intended by the decision documents?

The remedy for residential soils and gardens has been implemented and is functioning as intended by the decision documents. The remedy has not yet been implemented at most commercial/industrial properties and is therefore not functioning as intended.

Question B: Are the Assumptions made at the time of the remedy selection still valid?

For residential properties, the assumptions made at the time of the decision documents are still valid. The Hazardous Materials and Waste Management Division of CDPHE developed a commercial/industrial action level for lead in 1999. The remedy originally used 500 ppm lead as a protective number for both residential and commercial/industrial properties. As a result of the new policy, 1460 ppm was agreed to between Asarco and the State of Colorado in a "Notice of Joint Modification of Statement of Work and Medical Monitoring Program" in 2002. That change will affect the remedy for commercial industrial properties by reducing the number of properties requiring cleanup.

Changes in Risk Assessment Methodologies:

Exposure assumptions and general risk assessment methodologies used to determine health protective remedial actions for the Globe Site community soils are generally unchanged, as are toxicity values for arsenic and cadmium. However, lead screening values for lead in residential soil and methodologies for assessing adult lead exposure (i.e., lead on commercial or industrial properties) have been revised, as discussed below.

Per EPA OSWER Directive 9200.4-27P (August 1998) and Directive 9355.4-12 (July 1994), the screening level for lead in soil for residential land use areas has been revised downward to 400 ppm, in the absence of site-specific study. Therefore, the residential soil cleanup level for lead in community soils (500 ppm) exceeds current risk assessment guidance. It is not currently known whether any residential properties may remain onsite with a soil lead concentration level between 400 and 500 ppm. It is expected that some of the properties with lead levels in this range have already been remediated because of their co-location with arsenic or cadmium in soil at levels requiring soil remediation. An analysis of this residual risk is recommended.

Further, in 2002, EPA signed a ROD for the VBI70 Residential Soils Operable Unit where the action levels for arsenic and lead were 70 ppm and 400 ppm respectively. The proposed arsenic cleanup level based on the risk assessment was 240 ppm but was adjusted at the request of the community's desire to be consistent across neighboring sites. The lead cleanup level was altered from the risk-based number of 540 ppm due to assure community acceptance.

The cleanup level at the Globe Site for lead in soil at commercial/industrial properties (1460 ppm) is based on the general methodology provided in Attachment 3 of CDPHE's draft Soil Remediation Objectives (SRO) guidance document (December 1997). More recent risk assessment guidance is currently available for assessing risks to adults exposed to lead in soil (OSWER #9285.7-54 Recommendations of the Technical Review Workshop for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil. EPA-540-R-03-001. January 2003). The risk assessment methodology recommends incorporation of updated information on background levels of blood lead levels in adults (based on CDC's current NHANES data) and improved estimates of variation in adult blood lead levels. The current guidance identifies a range of remediation values for protection of adults exposed to lead in soil from 710 ppm to 1712 ppm, based on site-specific considerations. Input values used to derive the current remediation goal of 1460 ppm should be reviewed for consistency with current risk assessment guidance.

Finally, the risk assessment methodology used to calculate exposure dose and risk from ingestion of garden vegetables is outdated compared to currently available data on consumption levels and amount of inorganic arsenic (toxic species) versus organic arsenic (non-toxic form) present in a typical diet. However, soil cleanup levels adopted for the site are believed to be low enough to be protective for ingestion of garden produce.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

Plant Site Operable Unit

Question A: Is the remedy functioning as intended by the decision documents?

No. Not all components of the remedy have been implemented. While a large portion of the Asarco Globe Plant has been covered with hardscaping or community soils, some areas still need cover. The Point Source and Fugitive Air Emissions portion of the Plant Site Remedial Action is functioning as intended by the decision documents. The Former Sedimentation Pond remedy has been successfully implemented. The Spill and Runoff Control Pond remedy has been implemented. The threat of release to the community has been controlled.

Question B: Are the Assumptions made at the time of the remedy selection still valid?

No. The assumption that the Asarco Globe Plant would operate as it was in 1993 at the time of the ROD is no longer valid. Cadmium processing that was subject to remedy control is no longer in operation at the Plant. Emissions from new processes, refinement of high purity specialty metals, are permitted, are within the cancer and non-cancer risk levels proscribe by the remedy, and comply with State and Federal regulations. No changes in risk assessment methodologies have been noted.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy

No additional information has been identified that would call into question the protectiveness of the remedy.

6.0 ISSUES

Summary of Issues	Affects Protectiveness (N/Y)	
	Current	Future
Completion of the FNP OU	N	Y
Continued Groundwater monitoring	N	N
Continued operation of the Waste Water Treatment Plant	N	Y
Completion of Final Medical Monitoring Report	N	N
Sampling and remediation of Commercial/Industrial properties	Y	Y
Enforcement of Institutional Controls	N	Y
Continued placement of Community Soils on Plant	N	Y
Establishment and maintenance of a vegetative cover	N	Y

7.0 RECOMMENDATIONS AND FOLLOW UP ACTIONS

Issue: Recommendation and Follow-up Action	Party Responsible	Milestone Date	Affects Protectiveness (Y/N)	
			Current	Future
Completion of the FNP OU: Make funding available to implement the remedy as soon as possible.	Asarco	ASAP	N	Y
Continued Groundwater monitoring: Make funding available to continue monitoring floodplain groundwater as well as to monitor the Interceptor Trench.	Asarco	Until MCLs are met	N	N
Continued operation of the Waste Water Treatment Plant: Fund operational cost of WWTP including disposal of sludge into the FNP or off-site as necessary	Asarco	Until MCLs are met	N	Y
Completion of Final Medical Monitoring Report: Final set of biomonitoring data needs to be reported and a final analysis of trends and statistics must be compiled. This will officially end the Medical Monitoring Program.	CDPHE	2004	N	N
Sampling and remediation of Commercial/Industrial properties: Sampling of properties not yet sampled must commence and remediation of those properties that exceed commercial industrial levels must be completed.	Asarco	2004	Y	Y
Enforcement of Institutional Controls: Implement an Environmental Covenant	Asarco/State	ASAP	N	Y
Continued placement of Community Soils on Plant: Consent Decree between Asarco, EPA, and the State will assure continued placement of VBI70 soils on the plant site as well as grading, compaction, and re-vegetation of those soils according to the requirements of the SOW.	Asarco/EPA	2005	N	Y
Establishment and maintenance of a vegetative cover: The same Consent Decree will assure establishment of a vegetative cover to control erosion and windblown soils from leaving the property.	EPA	2005	N	Y

Former Neutralization Pond Operable Unit

Remedy design should be completed and implementation started as soon as all materials that are anticipated to be entombed in the FNP have been added.

Groundwater and Surface Water Operable Unit

Quarterly monitoring should continue. The Wastewater Treatment Plant should remain operational to assure treatment of water extracted from the Interceptor Trench. Floodplain groundwater should be monitored quarterly to assess the effectiveness of the remedy. A decrease in arsenic and cadmium levels should be observed after the passage of sufficient time as addressed in the Floodplain Monitoring Plan. Groundwater monitoring in the Localized Floodplain wells GW-64, GW-84, GW-86R, and GW-94 should be assessed to observe changes in metals concentrations over time.

Funding for the Wastewater Treatment Plant is subject to the requirements of the Asarco National Trust. In 2003, CDPHE requested $250,000 annually over the next three years (FY04-06) to assure continuous operation of the treatment system. The funding was allocated as requested for FY04.

Community Soils and Vegetable Gardens Operable Unit

The Final Report for the Globeville Medical Monitoring Program should be completed and made available for public review.

Sampling and remediation of qualifying commercial/industrial properties should commence as soon as possible. Community Soils and Gardens Operable Unit should be retained for the next 5-year review.

Plant Site Operable Unit

Continue placement of community soils in accordance with the requirements of the SOW. Establish and maintain a vegetative cover on the soils to address dust issues and erosion concerns expressed by members of the community and to comply with the Plan Site Soils Preliminary Design Report (February 1994). Establish and maintain a vegetative cover on the area. Should the property be redeveloped, issues will arise that will require coordination with CDPHE to assure that any future use is consistent with the remedy. Care must be taken to prevent or minimize exposure to contaminated soils during demolition and excavation activities. All future processes at the Asarco Globe Plant must comply with applicable state and federal ambient air quality standards.

8.0 PROTECTIVENESS STATEMENTS

Overall, the results of this second five-year review indicate that all immediate threats at the site have been addressed and the remedy is expected to be protective of human health and the environment after all components are completed as proposed. Long-term protectiveness of the remedial actions will be verified through the annual monitoring. Current data indicate that the remedy is functioning as anticipated and will achieve performance objective once all components have been implemented. The only portion of the remedy that impacts current protectiveness is the sampling and remediation of commercial and industrial properties. It is expected that Asarco will begin implementation of that portion of the remedy in the 4th quarter of calendar year 2004.

Operable Unit 1 Former Neutralization Pond

The remedy at OU1 is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that would result in unacceptable risks are being controlled maintaining a clean soil cover that is graded for proper drainage. Until the remedy is implemented, contaminated groundwater continues to be added to the system requiring extraction from the Terrace Drain and treatment in the Wastewater Treatment Plant.

Operable Unit 2 Groundwater and Surface Water

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals through continued extraction and treatment as well as natural attenuation, which is expected to require several decades to achieve. Exposure pathways that could result in unacceptable risk are being controlled and institutional controls are preventing exposure to, or the ingestion of contaminated groundwater.

Long-term protectiveness of the remedial action will be verified by maintaining quarterly monitoring of groundwater to fully evaluate the natural attenuation and potential migration of the floodplain plume towards the Platte River. Current data indicate that levels of arsenic and cadmium exceed the MCLs. Current monitoring data indicate that the components of the remedy that are in place are functioning as expected to achieve groundwater cleanup goals.

Operable Unit 3 Community Soils and Vegetable Gardens

The remedial action for residential soils and vegetable gardens has been completed and is protective. However, commercial and industrial properties have not yet been thoroughly sampled or remediated. Therefore, the remedial action for a portion of the operable unit is not protective of human health and the environment at this time. Implementation of the commercial industrial property sampling and remediation need to take place to ensure protectiveness. The remedy is expected to be protective of human health and the environment upon completion.

Operable Unit 4 Plant Site

The remedial actions at the Former Sedimentation Pond, Point Source and Fugitive Air Emissions, and the Spill and Runoff Control Pond are protective. However, because the remedial action for Surface Soils and Buildings has not yet been completed, the site is not protective of human health and the environment. Additional placement of community soils on the Plant will ensure protectiveness. Threats at the site have been addressed through stabilization and capping of contaminated soils and sediments, and the implementation of institutional controls. The remedy for buildings is protective in the short term because exposure pathways that could result in unacceptable risk are being controlled.

9.0 NEXT REVIEW

The Asarco Globe Superfund Site is a Statutory Site that requires ongoing 5-Year Reviews. The next 5-Year Review will be conducted within 5 years of the completion of this 5-Year Review report. The completion date is the date of the signature shown on the signature cover page attached to the front of this report. All Asarco Globe Operable Units without a Notice of Completion (NOC) will be included in future Five-Year Reviews.

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10.0 REFERENCES

General

U.S. Environmental Protection Agency. 1991. OSWER Directive 9355.7-02, Structure and Components of Five-Year Reviews.

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Community Soils and Vegetable Gardens Operable Unit

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Plant Site Operable Unit

Fourth Quarter 2002 Ambient Air Monitoring Asarco Globe Date Transmittal May 2004.

Draft Supplemental Preliminary Design Report for the Former Sedimentation Pond, Prepared for Asarco Incorporated, Denver, Colorado, EnviroGroup Limited, July 2003.

Work Plan, Former Sedimentation Pond Project, Globe Site, Denver, Colorado, Shaw Environmental, Inc., November 2003.

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Figures

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Color Photo(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

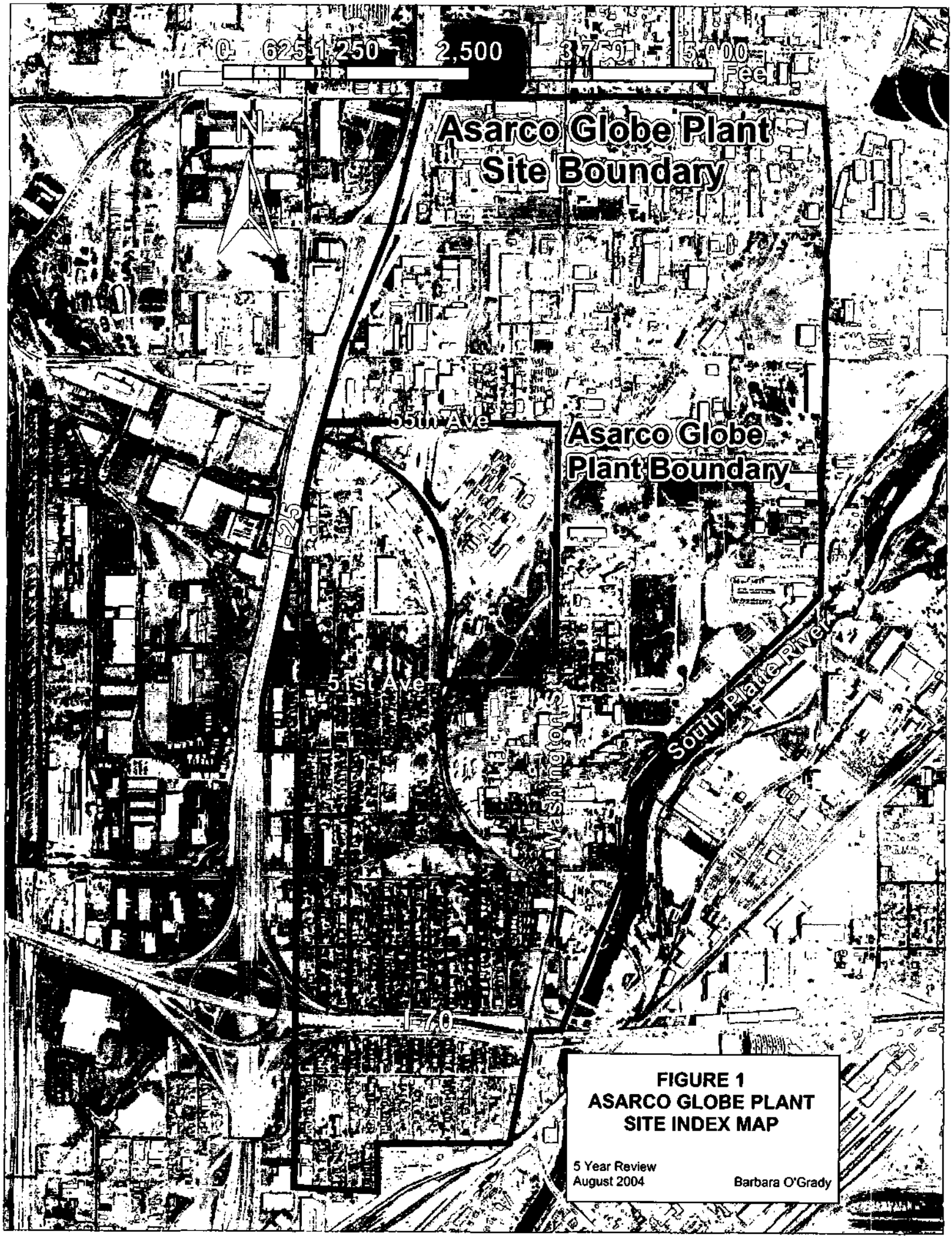


FIGURE 1
ASARCO GLOBE PLANT
SITE INDEX MAP

5 Year Review
August 2004

Barbara O'Grady

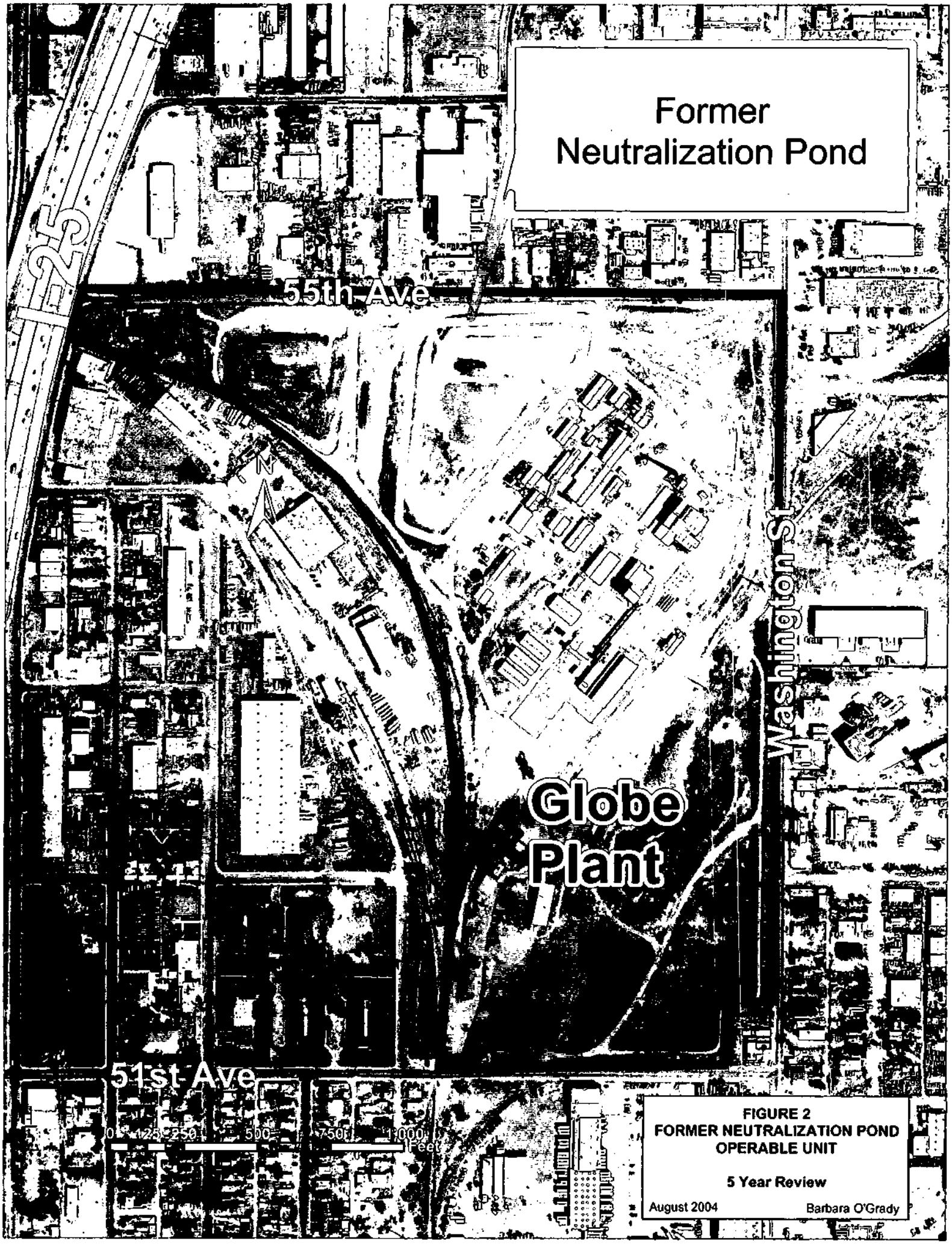


FIGURE 2
FORMER NEUTRALIZATION POND OPERABLE UNIT

5 Year Review

August 2004 Barbara O'Grady

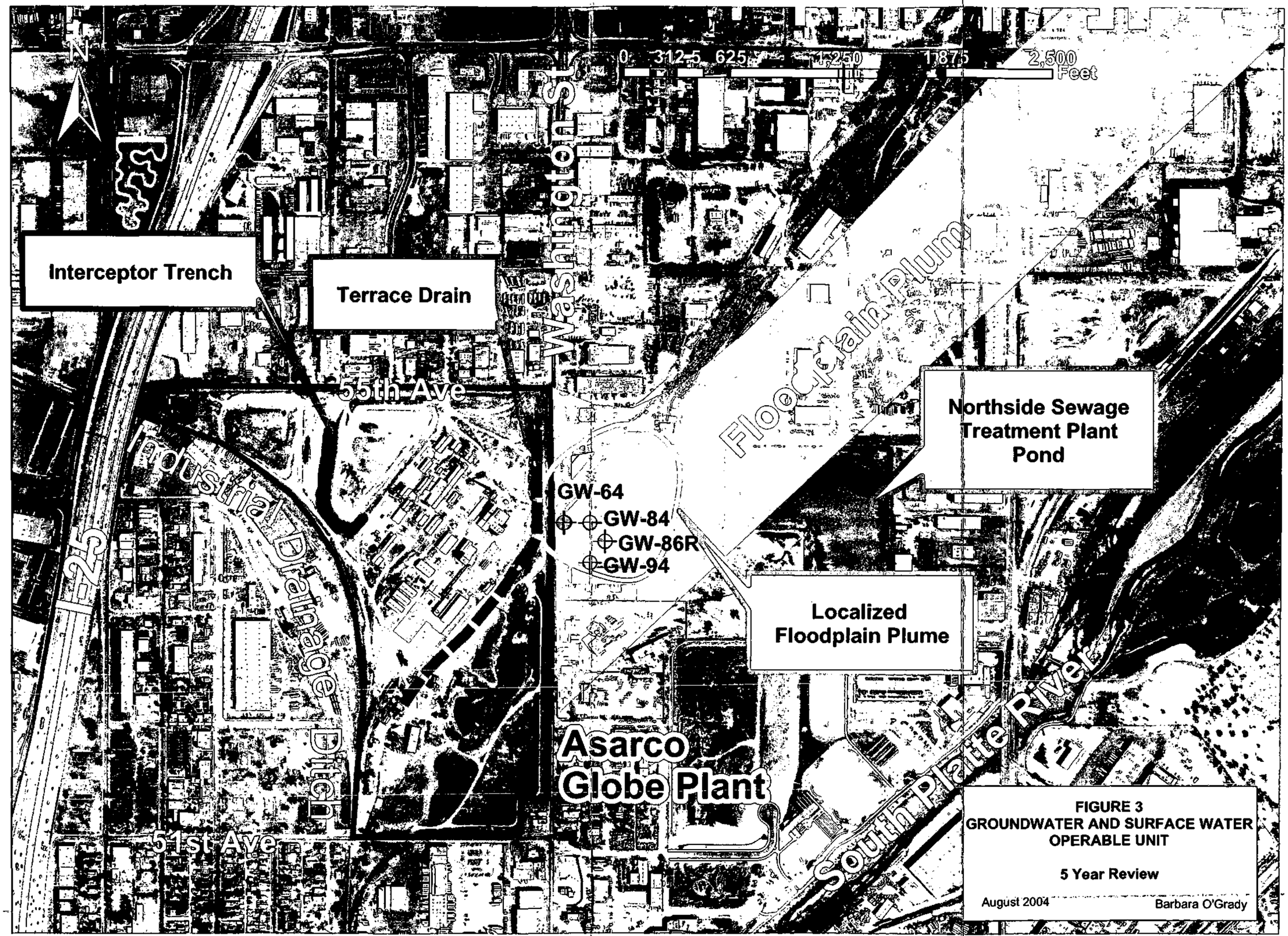


FIGURE 3
GROUNDWATER AND SURFACE WATER OPERABLE UNIT

5 Year Review

August 2004 Barbara O'Grady

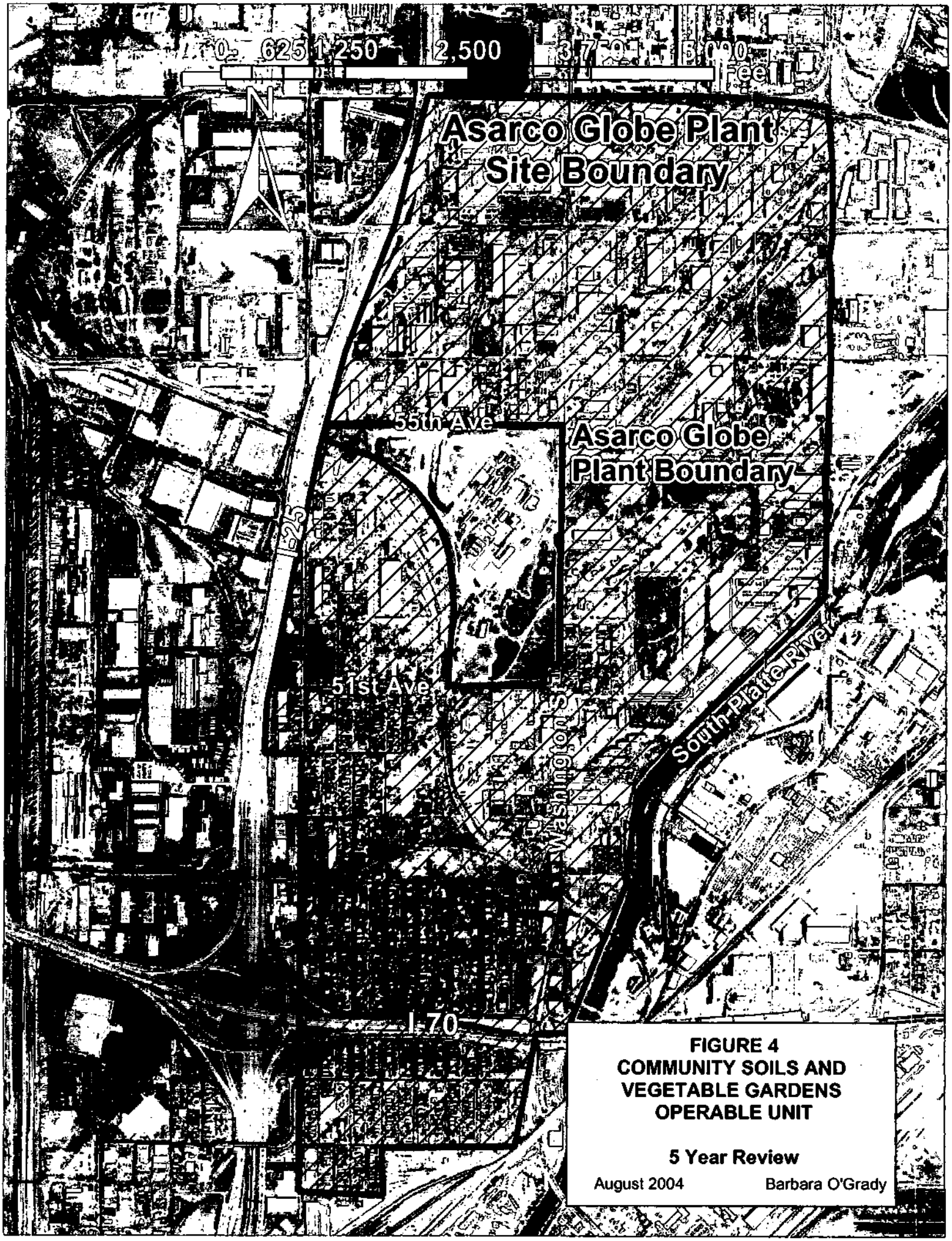


FIGURE 4
COMMUNITY SOILS AND VEGETABLE GARDENS OPERABLE UNIT

5 Year Review

August 2004 Barbara O'Grady

FIGURE 5
PLANT SITE

5 Year Review

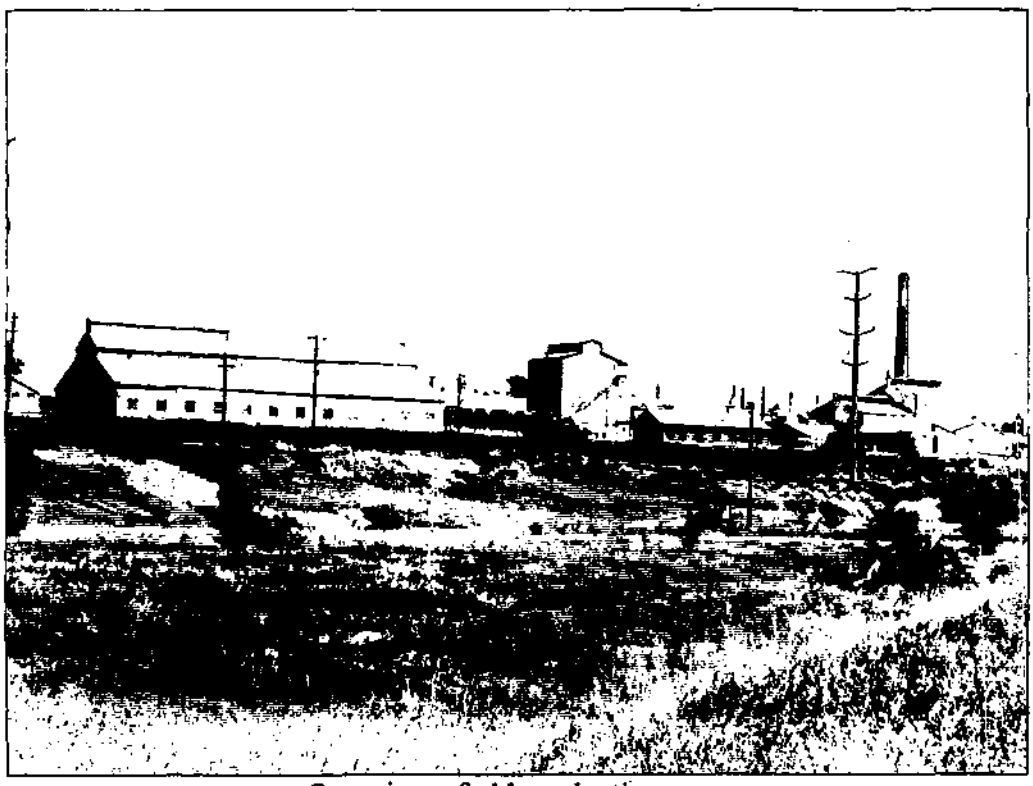
August 2004 Barbara O'Grady

Appendix A

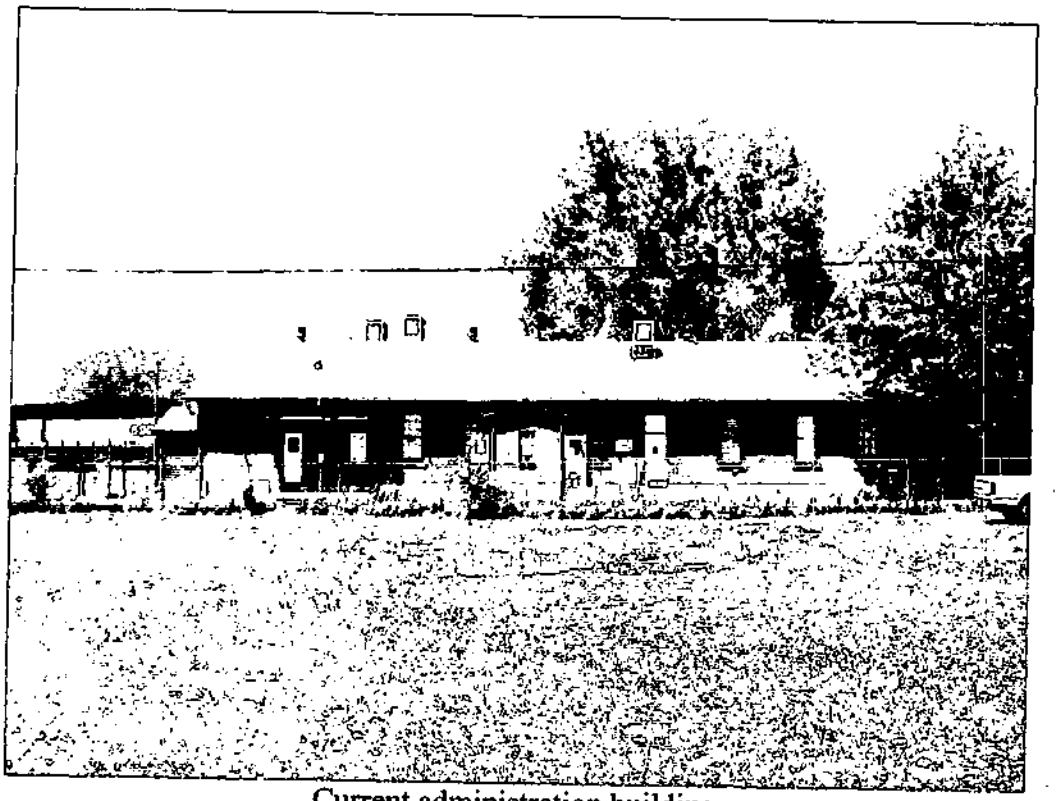
Site Photographs

Appendix A

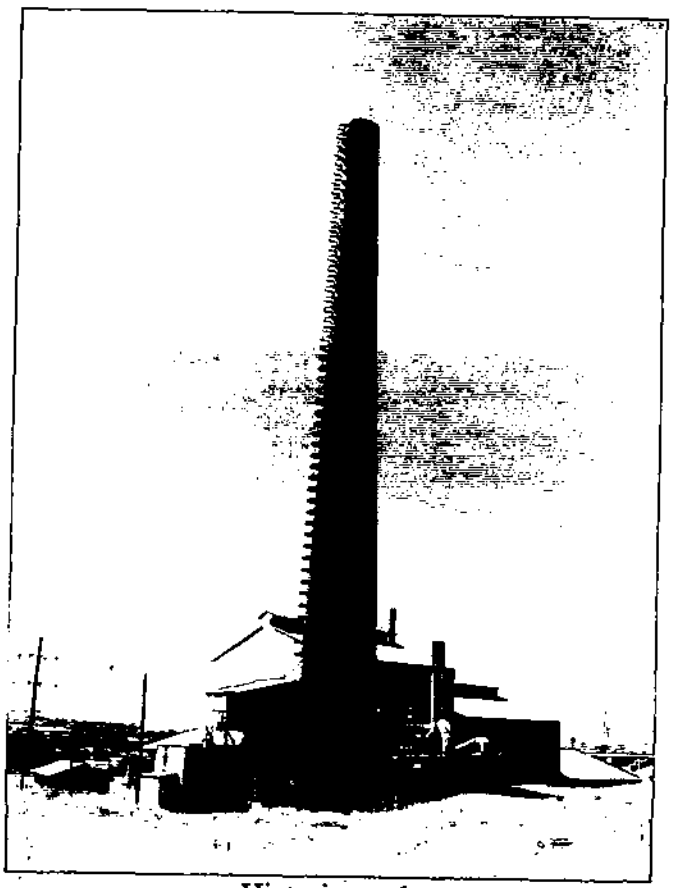
Plant Entrance on 51st Avenue



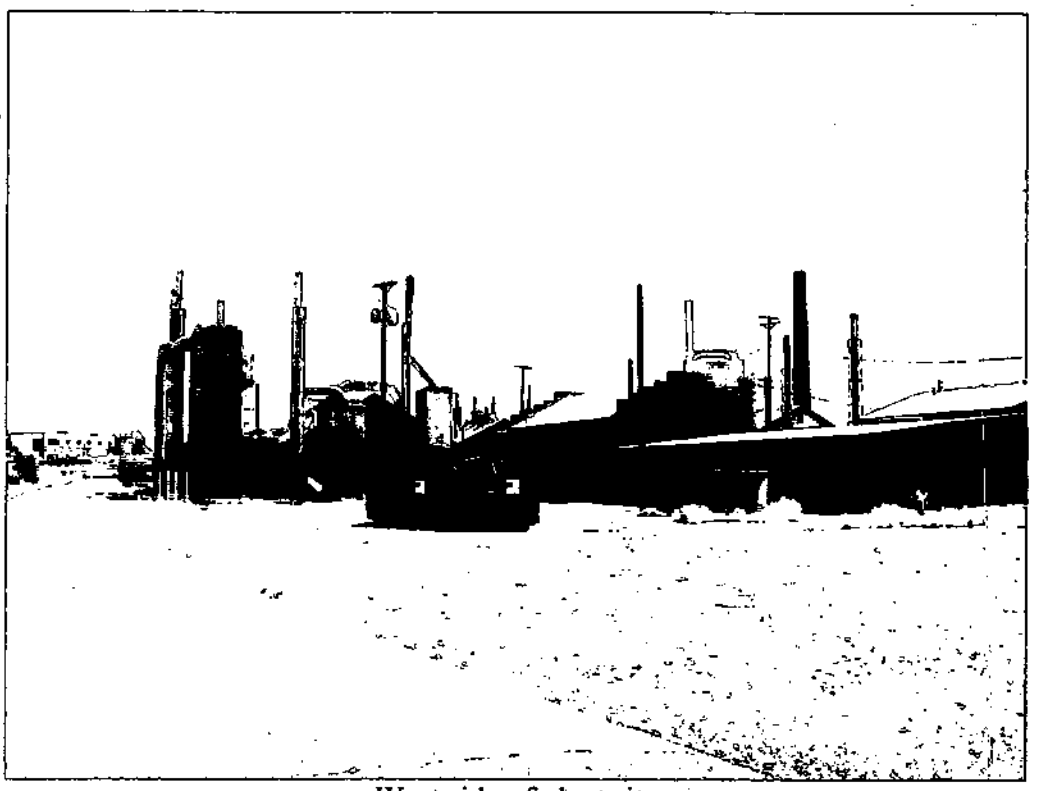
Overview of old production area.



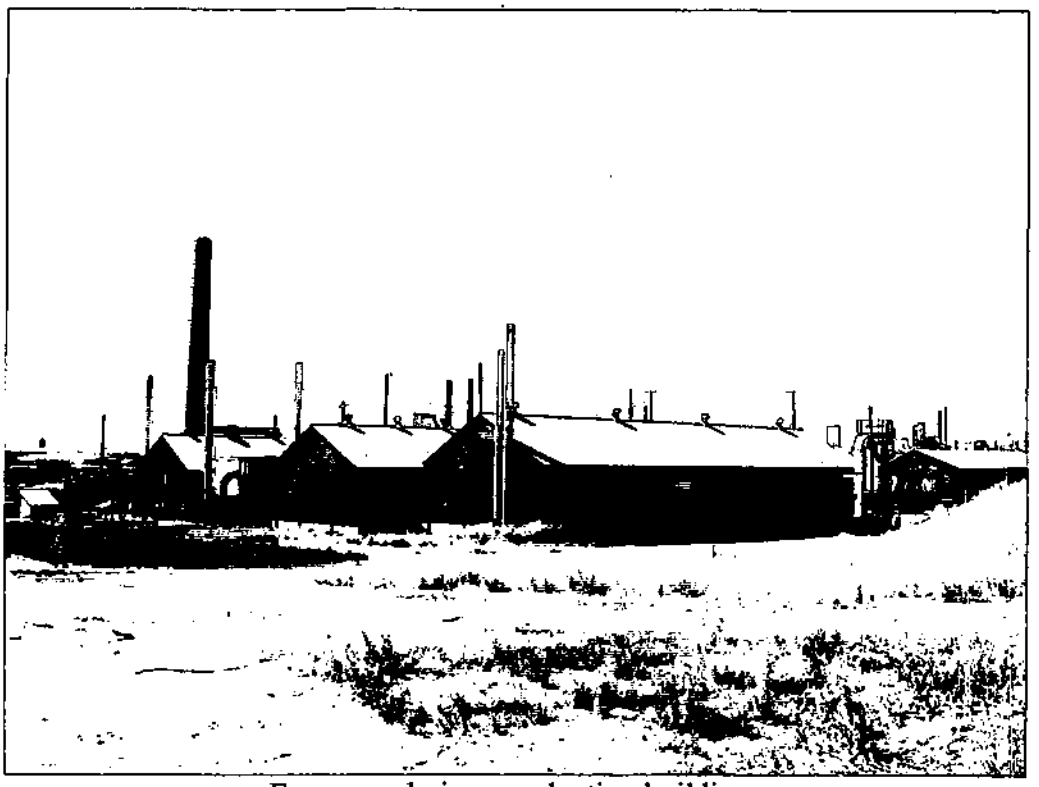
Current administration building



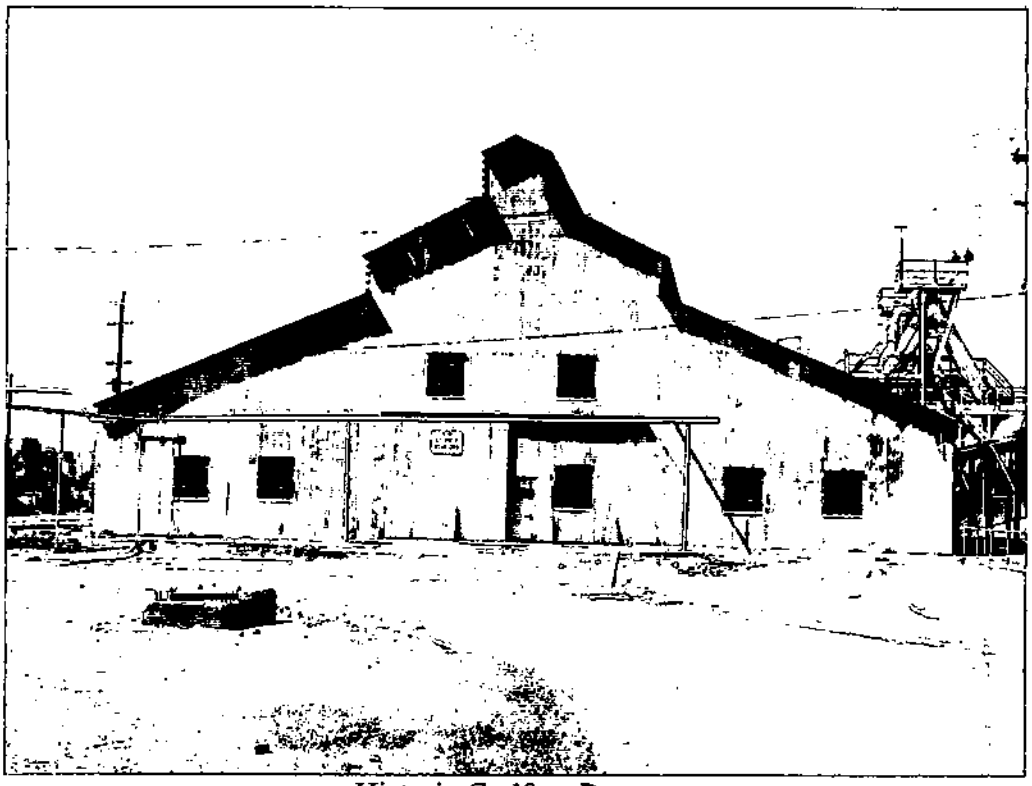
Historic stack-



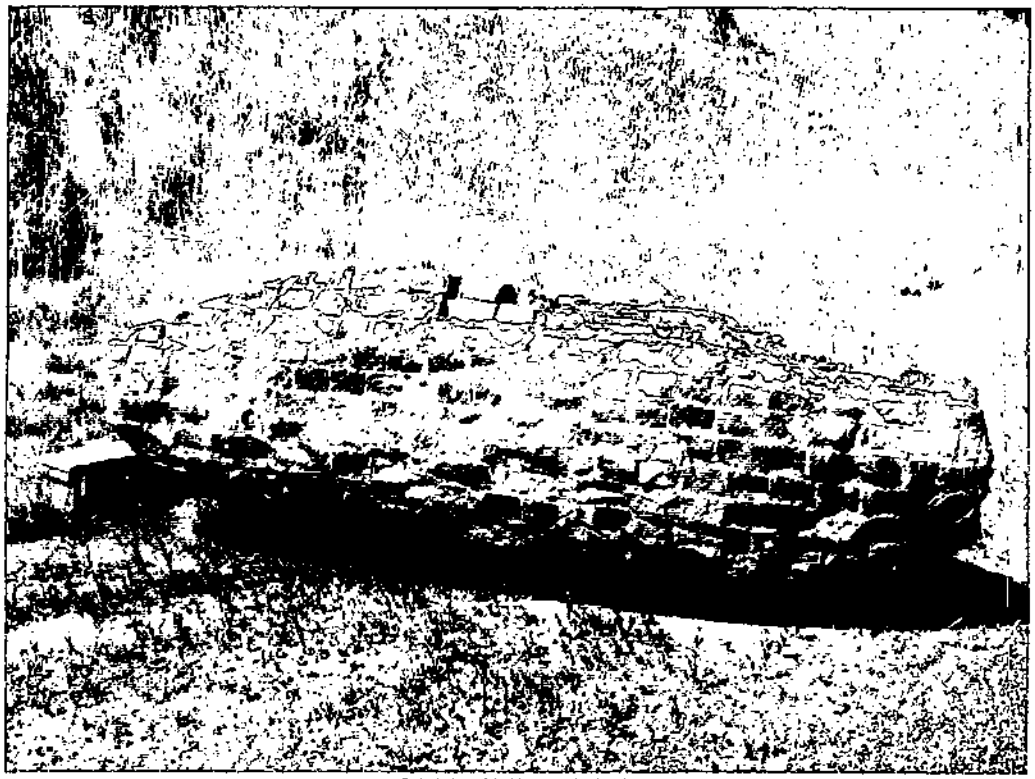
West side of plant site



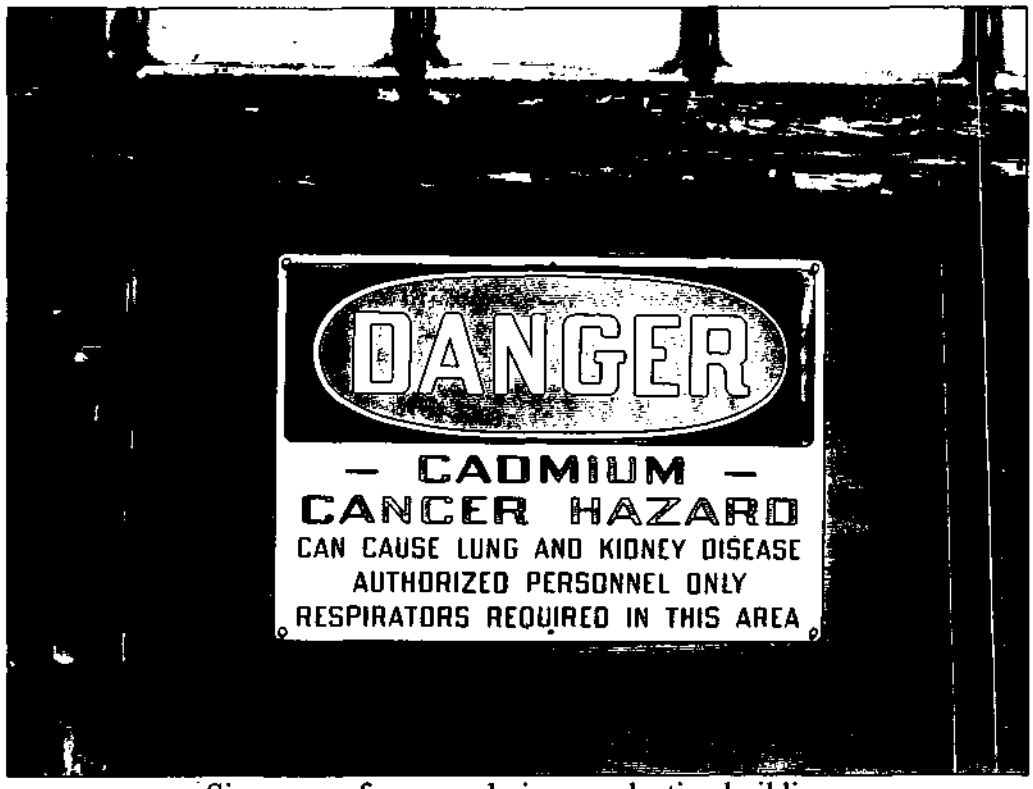
Former cadmium production buildings



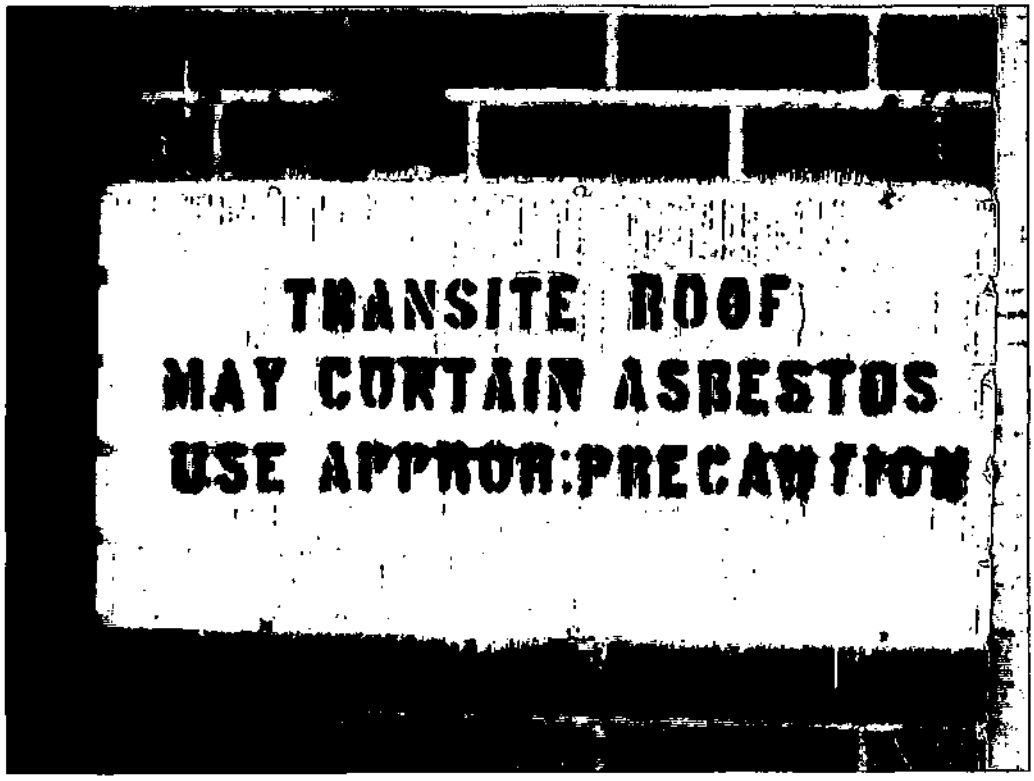
Historic Godfrey Roaster



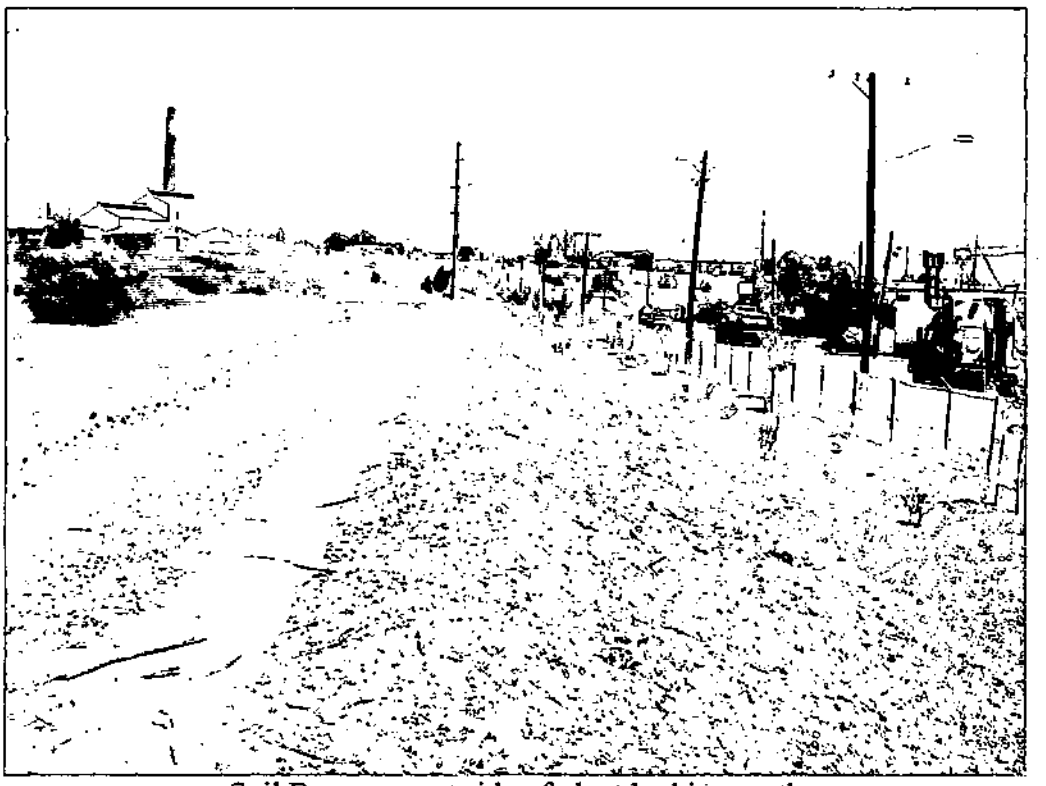
Old building debris



Signage on former cadmium production building



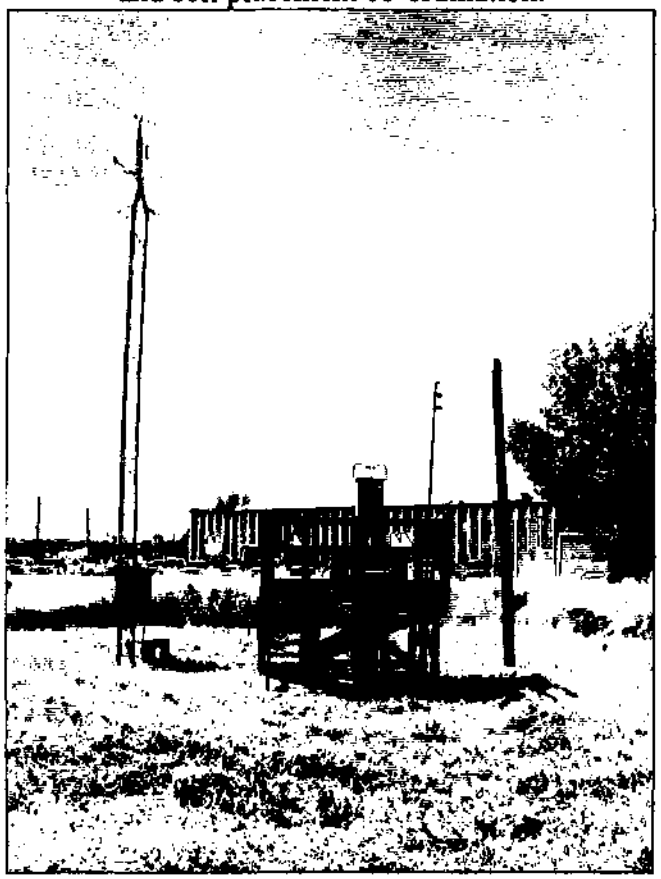
Soil berm on south side of plant at 51st Avenue



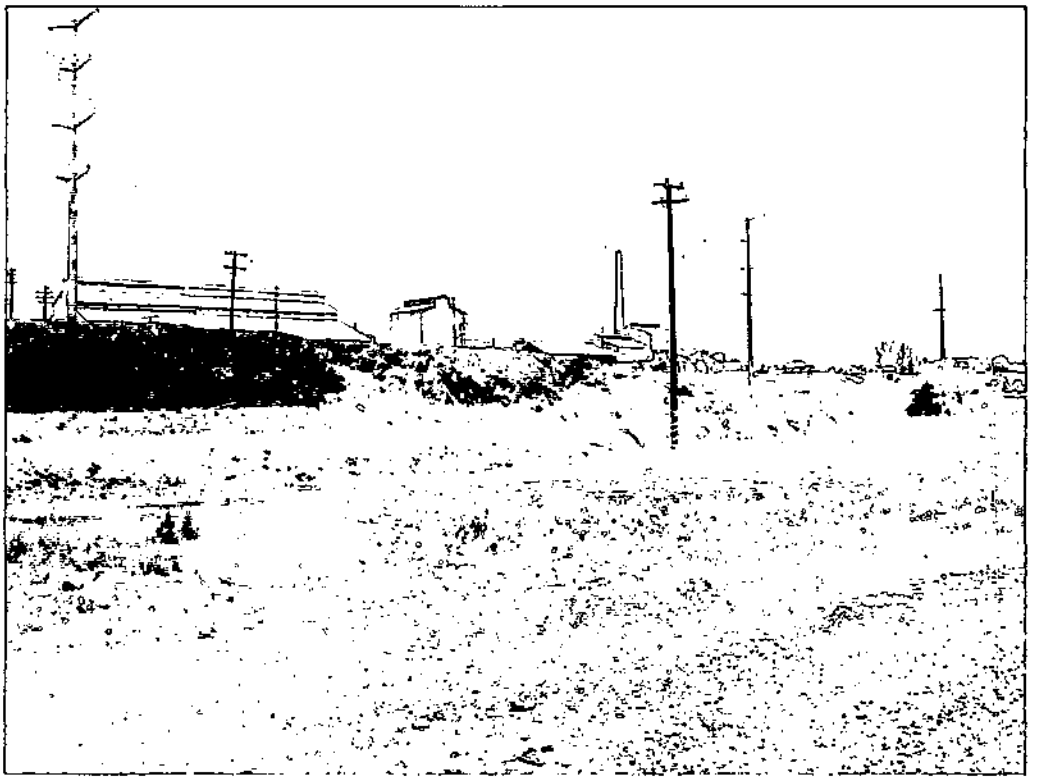
Soil Berm on east side of plant looking north

Soil berm on east side of plant looking south

Looking west along 55th avenue towards EPA construction trailers for VBI70 and soil placement co-ordination.

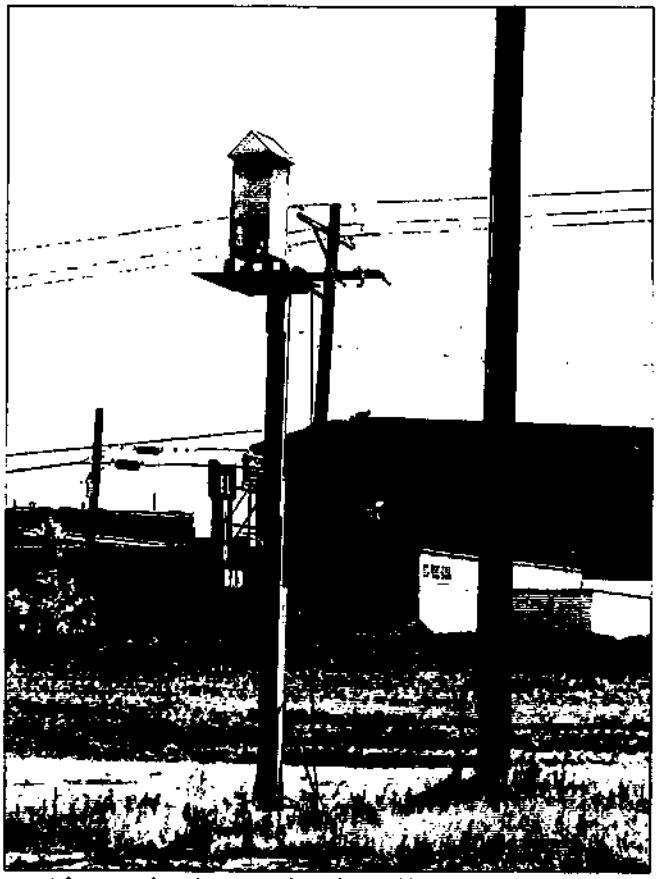


Meteorological station at northwest corner of plant site



Soil placement along slag face

Grading and compacting of community soils



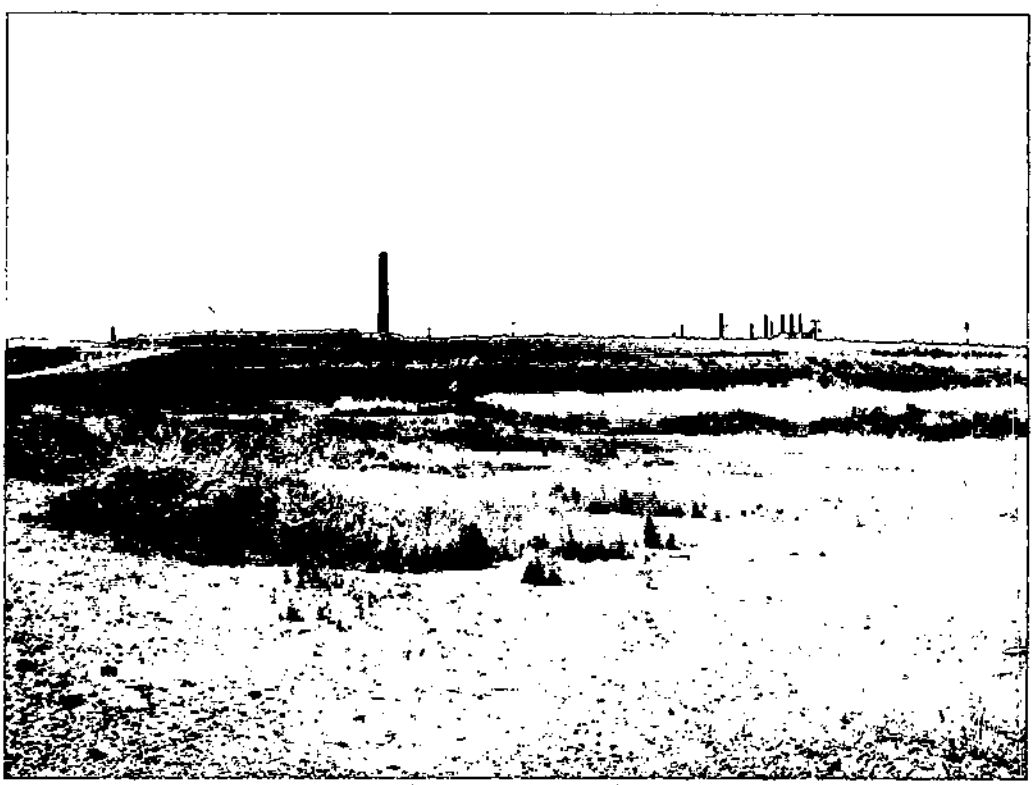
Air monitoring station in soil placement area

Debris piles from EPA soil placement activities

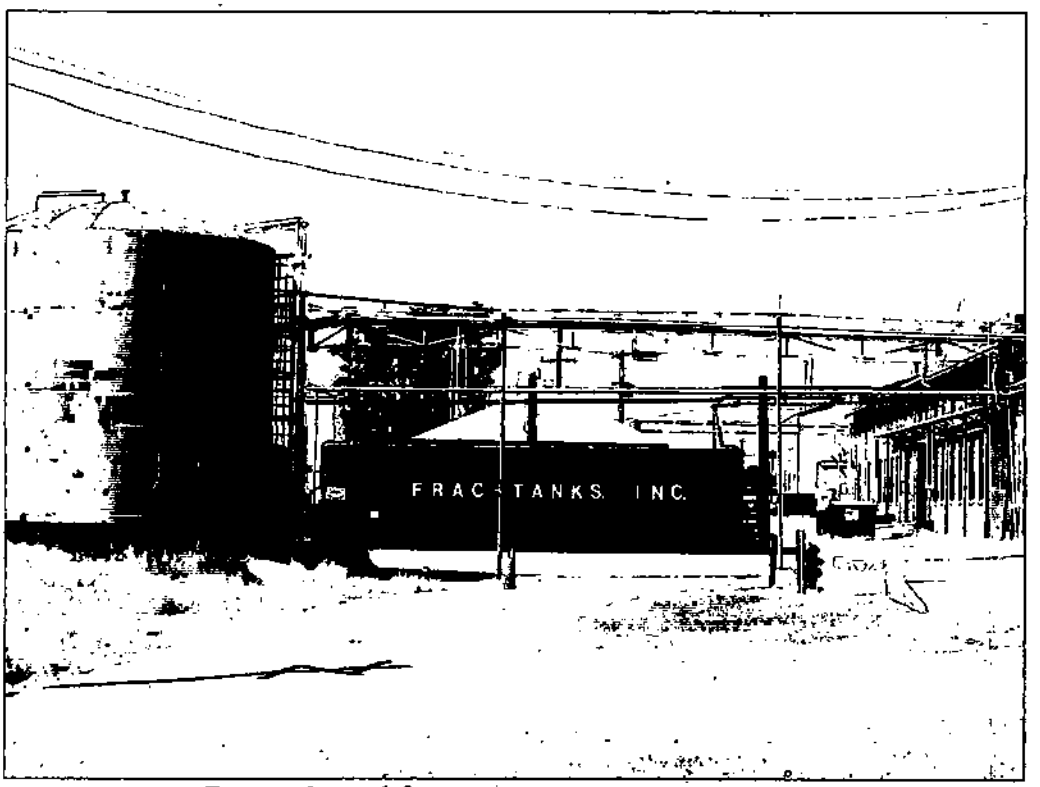
North of FNP looking west towards EPA trailiers

Clean soil stockpile north of FNP

FNP



Back side of FNP looking east



Frac tank used for waste water treatment process

Former sedimentation pond

Drainage from former sedimentation pond

Rail line on west side of plant traveling south

Appendix B

Monitoring Data

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LAB AND DATABASE FLAG SUMMARY - PARAGON ANALYTICS, INC.

4TH Quarter 2003

Dissolved Groundwater Metals (All Units are mg/L)

Location	Lab ID	As	Cd	Zn
Performance objective		0.05	0.005	5.0
GW-42	0312126-1	<0.01	**1**	**21**
GWFB-475	0312126-2	<0.01	<0.001	<0.02
GW-78	0312126-3	<0.01	**0.22**	1.8
GW-78 DUP	0312126-4	<0.01	**0.22**	1.8
GW-79	0312126-5	<0.01	**0.16**	0.59
GW-80R	0312126-6	**0.19**	**0.55**	3.2
GW-25	0312126-7	<0.01	**0.033**	**17**
GW-24	0312126-8	<0.01	**0.026**	0.19
BH-13	0312126-9	<0.01	<0.001	0.021
GW-43	0312126-10	0.013	**0.73**	**12**
GWFB-476	0312126-11	<0.01	<0.001	<0.02
GW-121	0312126-12	**110**	**0.02**	<0.02
GW-64	0312126-13	**4**	**5.2**	2.6
GW-84	0312126-14	**0.45**	**3**	1.9
GW-84 DUP	0312126-15	**0.45**	**3**	1.8
GW-86R	0312126-16	0.018	**0.53**	3.4
GW-21	0312126-17	**0.25**	**0.31**	2.1
GWFB-477	0312126-18	<0.01	<0.001	<0.02

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Appendix C

Community Involvement Plan

ASARCO GLOBE

REVISED COMMUNITY INVOLVEMENT PLAN

AUGUST 2004

Colorado Department of Public Health and Environment

HAZARDOUS MATERIALS

AND WASTE MANAGEMENT DIVISION

(303) 692-3300

COMMUNITY INVOLVEMENT PLAN

ASARCO GLOBE SITE

Revised, August 2004

Section 1.0
Introduction

The Colorado Department of Public Health and Environment (CDPHE) Community Involvement Program is committed to promoting community involvement and communication between citizens, CDPHE, and other agencies and stakeholders. This Community Involvement Plan (CIP) Update describes the community involvement and public participation program developed for the Asarco Globe Site in Denver, Colorado. The CIP Update was developed in coordination with the US Environmental Protection Agency (EPA) Region 8, and revises the previous Asarco Globe CIP Update, dated January 1995.

This CIP was developed in accordance with guidance found in Superfund Community Involvement Handbook, October 2001. The Handbook outlines community involvement requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CRECLA), as amended by the Superfund Amendments and reauthorization Act of 1986 (SARA) and as stipulated in the regulations that interpret the Superfund legislation – the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This CIP Update is being released concurrently with a five-year review of the Asarco Globe site. The five-year review determines whether remedial response actions are protective of human health and the environment and recommends ways to attain or maintain that protection. The five-year review is also required under CERCLA and the NCP. The five-year review does not reconsider decisions made during the remedy selection process; it evaluates the implementation and performance of the selected remedies.

1.1 Purpose

The purpose of the Asarco Globe CIP Update is to:

- Ensure two-way communication between the community and CDPHE. Develop and maintain open communication between CDPHE, the EPA, the City of Denver, Asarco, community leaders, environmental or other public interest groups, and any other interested or affected groups.
- Summarize community involvement program activities that have occurred through progressive phases of remediation. Determine which actions have been most effective and which have not.

- To develop or update public involvement and communication methods that address community concerns.
- Identify and monitor community concerns.

Section 2.0
Site Description

2.1 Physical Description

The Asarco Globe Plant is located at 495 East 51st Avenue, Denver, Colorado, in the Globeville neighborhood. The northern portion of the plant property is located in Adams County and it's southern portion in the City and County of Denver. The property is bounded by 55th Avenue to the north, by Washington Street to the east, by 51st Avenue to the south, and by the Industrial Drainage Ditch, formerly known as the Rocky Mountain Waste Ditch to the west. The site is located along the west edge of the South Platte River floodplain, about 2.7 miles upstream of the confluence with Clear Creek.

The majority of the Plant is located on a terrace that rises about 30 to 60 feet above the floodplain. Only the southwest portion of the plant is located in the floodplain. Historically, Asarco owned a 50-acre tract of land east of their current property, termed the "Asarco Annex," which was used for the disposal of milling wastes. The property currently under Asarco's ownership consists of approximately 78 acres and 53 buildings. The Asarco Globe site includes the plant property and adjacent properties believed to be contaminated by releases originating at the Globe Plant. Metals contamination in Globeville cannot wholly be attributed to the Asarco Globe Plant due to the historical existence of other smelters in the area.

2.2 General Site History

Edward R. Holden built the Globe Plant with the backing of bankers Kountze and Sheedy. It was one of several smelters built in the northern suburbs of Denver between 1875 and 1890. The Argo Smelter, and the Omaha and Grant Smelter were two others that operated in the area. Railroads brought ore from Montana and northern Mexico to the smelters.

The Globe Plant began operations in 1886, and around 1889 ownership changed to Benjamin Guggenheim, who renamed the company, Globe Smelting and Refining. The American Smelting and Refining Company bought the plant in 1901, renamed Asarco, Inc. in 1975, and has retained ownership since.

During early operations at the Globe Plant, the primary production process was conventional smelting carried out in blast furnaces for the production of gold, silver, lead and copper. Lead smelting operations were discontinued in 1919, and arsenic roasting and refining furnaces were put into operation in 1921. Arsenic production continued until 1926, at which time plant operations were regeared for cadmium production.

The Globe Plant was one of the largest of the nation's few producers of cadmium, which is used in the manufacture of rechargeable nickel-cadmium batteries, paint and electroplating. Cadmium production continued at varying rates until 1993.

Thallium was also produced at various times between 1920 and 1979. Thallium is used in the manufacture of electrical parts and rodent poison. Indium, used to manufacture the trigger device of sprinkler systems, was collected when it occurred in commercial quantities in the lead fume and dust. High-purity metals such as copper, antimony and tellurium are used in the manufacture of allows used commonly in high-tech and defense applications. Litharge (lead oxide) and other specialty metals and high-purity metals are still produced at the plant.

The primary waste product from the plant has been acidic liquor containing dissolved metals. This liquid waste has been placed in an unlined sludge pond known as the Former Neutralization Pond. The sludge pond area was constructed northwest of the Plant's buildings around 1949. As the pond filled, the solids have been dredged to the sides to raise the containment berm. Runoff and seepage from the pond and berm were collected in a small, unlined ditch adjacent to the waste piles that discharged into the Industrial Drainage Ditch (IDD).

In 1974, Asarco constructed an unlined interceptor trench between the waste pile and the IDD. A pump system was installed to recirculate liquids from the trench back to the sludge pond. This was only partially successful. While the contaminants were kept from entering the IDD by lowering the water table, the recirculated water picked up more contamination that could be carried by groundwater.

The waste storage area encompasses approximately seven acres on the northwest side of the plant facilities. The waste pile is more than 8 feet high. Historically, wastes were also disposed of at the Asarco Annex. The solid wastes were either buried or removed from that location.

2.3 Cleanup and Regulatory History

In 1974, the Colorado Department of Health collected water and sediment samples from the IDD, detecting elevated concentrations of cadmium, lead and some other metals. In 1980 and 1981, CDPHE found the site to be out of compliance with the Colorado Solid Waste Disposal Sites and Facilities Act. Subsequent to investigations by CDPHE, the EPA listed the Globe plant site on the Open Dump Inventory for 1981 under Resource Conservation and Recovery Act (RCRA) Section 4000 criteria. A preliminary uncontrolled hazardous waste site ranking, as defined by the NCP, was conducted in 1982. Soils, sediments, wastes and surface water at the site and vicinity were sampled in December 1982. Three groundwater-monitoring wells were installed on site during this time.

In September 1982, the EPA National Enforcement Investigations Center conducted airborne particulate sampling on the plant site. A report completed in June 1983 provided a summary and interpretation of data collected during 1982 and 1983. The data that was gathered at that time did not provide justification for proposing the site for the National Priorities List (NPL).

In December 1983, the State of Colorado sued Asarco for damages to natural resources and risk to public health in State of Colorado v. Asarco, Inc. In 1986, CDPHE issued an Administrative Compliance Order against Asarco alleging violations of hazardous waste management requirements under the Colorado Hazardous Waste Management Act. After negotiating a Compliance Order on Consent in 1987, the State and Asarco entered into a Memorandum of Agreement (MOA) to conduct joint studies to assess and clean up the site in a manner consistent with the requirements of the NCP, to undertake some interim remedial actions, and to facilitate a negotiated settlement of litigation.

In the following years, a comprehensive Remedial Investigation, Public Health Evaluation, and Feasibility Study were conducted as part of the joint investigation of the Globe Plant site.

The objectives of the Remedial Investigation were to determine the extent, magnitude, sources and impacts, if any, of contamination due to releases of hazardous substances from the site; and to gather necessary data to assist in preparation of the Public Health Evaluation and Feasibility Study. The Remedial Investigation included a source inventory, air monitoring sampling and investigations of groundwater, surface water, soil and vegetation at the site. The Remedial Investigation was finalized in March 1992.

The Public Health Evaluation evaluated the potential impact on human health from the site if no remedial actions were to occur and was finalized in April 1992. The Feasibility Study developed and evaluated potential clean-up alternatives. The Feasibility Study was finalized in May 1992.

Selected Remedy in Record of Decision

- Provide medical monitoring to area residents
- Contain and close the Former Neutralization Pond
- Install a terrace drain to cut off the release of contaminated groundwater from the plant site
- Excavate and dispose of IDD and retention Pond sediments
- Cap or remove detention Pond sediments
- Excavate and remove, cap control exposure to, or deep till contaminated community soils
- Excavate, cap control exposure to, or deep till plant site soils above worker or trespasser action levels
- Cover and vegetate the lead slag pile
- Excavate and stabilize contaminated plant site sediments
- Seal floors and sumps as necessary during wet operations
- Install further air pollution point source and fugitive emission controls
- Use institutional controls, maintenance and monitoring to supplement the remedy

Figure 1

Upon receipt and consideration of public comment, the most viable alternatives evaluated in the Feasibility Study were selected and presented for public comment in the Proposed Plan in October 1992.

Upon receipt and consideration of public comment on the proposed remedy in the Proposed Plan, the Record of Decision (ROD), that outlines the selected remedy for the site, was issued in

February 1993. The selected remedy in the ROD included medical monitoring, residential soils cleanup, and soils and surface and groundwater cleanup at the plant site (***See Figure 2***).

The State of Colorado and Asarco, Inc. reached a settlement in July 1993 as stipulated in the Consent Decree. The Consent Decree Statement of Work builds upon the ROD and is the plan for implementation of remedial work at the Asarco Globe Plant site. It also stipulates State administrative and technical oversight, reimbursement of State costs, and payment of natural resource damages.

In 1991, a private attorney agreed to represent residential property owners and former Stapleton Homes' residents in a class action suit against Asarco (Escamilla et al. vs. Asarco, Inc.) for cleanup and property damages. The members of the class included residential property owners in North Globeville. The lawsuit was settled in the fall of 1993. The $24 million settlement included a cash award and soil remediation for members of the class. Additionally, residents of Stapleton Homes were given cash awards as a result of being relocated when their housing was closed in 1989. Stapleton Homes was a subsidized housing complex owned by the City of Denver and managed by the city's Housing Authority.

In 1997, a second class action lawsuit was filed against Asarco (C de Baca et al. vs. Asarco, Inc.). Class members include citizens in South Globeville, south of Interstate 70 (I-70), who were not included in the Escamilla lawsuit. The $12.3 million settlement, agreed to in November 1999, includes a cash award for 390 property owners and renters and soil remediation for 285 properties. It also includes funds to pay for engineering services to supervise the remediation, for a claims administrator, and for a contingency fund for any unusual hardship suffered by class members as a result of the remediation.

2.3 Environmental Concerns

Arsenic, cadmium, zinc and lead were found in elevated concentrations over a large geographical area, with concentrations generally decreasing with distance from the Plant site. The Public Health Evaluation found the contaminants of concern in various media including air, soil, sediments, surface water, groundwater and garden vegetables.

Exposure studies looked at the ways in which people in the vicinity of the site could potentially be exposed to the contaminants of concern. Exposure pathways that were examined included inhaling of ambient air, drinking the groundwater, eating vegetables grown in the soil, inhaling blowing soil, ingesting contaminated soil, ingesting IDD sediments and dermal absorption of IDD water.

The health effects of these metals include carcinogenic (cancer causing) and non-carcinogenic impacts. Health effects are associated with the type of exposure, the level of exposure, the length of exposure, the frequency of exposure and other factors. For more information on the health impacts of these metals, please see the ROD, the Public Health Evaluation, or the Agency for Toxic Substances and Disease Registry's Public Health Assessment for the Asarco Globe site.

The Globe area medical monitoring results from 1994 to 1999 indicate no community-wide evidence of health effects from the Globe Plant. A 1995 Colorado Department of Public Health and Environment cancer study found that for areas near the Globe Plant, the number of observed cancer cases for all cancers studied was similar overall to the number expected based on the cancer rates in the Denver Metro area. The cancer study analyzed cancers with known association with arsenic, cadmium and lead exposure, as well as the number of all types of cancer combined that are reported to the Colorado Central Cancer Registry.

2.4 Remedial Activities to Date

For the past nine years, Asarco has been cleaning up lead, cadmium and arsenic contamination in the soils of the Globeville community. While Asarco's residential soils cleanup in Globeville is nearly complete, Asarco's financial difficulties have left the cleanup of the Globe plant and surrounding commercial properties incomplete.

The Consent Decree calls for measures to reduce and monitor toxic emissions from the plant, reduce future contamination of ground water, clean ditches on plant grounds, close a hazardous waste pile on the plant, sample community soils and clean up those soils that are a health concern due to metals, provide a medical monitoring program and provide long-term monitoring of the site. The Asarco Globe Plant Site has been divided into four Operable Units (***See Figure 2***).

By 2004, all residential properties (approximately 700) surrounding the Plant that exceeded the State action levels have been remediated, the Industrial Drainage Ditch and Retention Ponds' work has been completed, as has work on the terrace drain ground water collection system.

Four Operable Units at the Asarco Globe Plant

1. **Former Neutralization Pond**
2. **Groundwater and Surface Water**
   - Terrace Groundwater
   - Floodplain Groundwater
   - Industrial Drainage Ditch & 51st Avenue Retention Ponds
   - Northside Sewage Treatment Plant Pond
   - Localized Floodplain Plume
3. **Community Soils and Vegetable Gardens**
4. **Plant Site**
   - Buildings
   - Point Source and Fugitive Air Emissions
   - Surface Soils
   - Former Sedimentation Pond
   - Spill and Runoff Control Pond.

Figure 2

Former Neutralization Pond
The Former Neutralization Pond (FNP), located in the north central portion of the Asarco Globe Plant, was originally used for disposal of production related wastewater generated at the Plant. Since most of the water drained or evaporated, what remained existed as pore water (water filling the spaces between grains of sediment) within the precipitate materials. These precipitates, primarily gypsum, contain various metals, including elevated levels of cadmium and arsenic. An interim remedial action - regrading and capping the pond with six inches of clay soil and revegetating it - was implemented in 1986. Since then, the FNP has been used for disposal of site-related sediments and sludge from the on-site wastewater treatment plant and sediments from the Former Sedimentation Pond. Final remediation outlined in the

ROD incorporates an in-place closure with a slurry wall, a multi-layer cap, maintenance of inward groundwater flow, treatment of collected groundwater, periodic monitoring, and institutional controls.

Groundwater and Surface Water

In the Record of Decision, the preferred groundwater remedy is described as a terrace drain system, excavation and disposal of IDD and Retention Pond sediments, extraction of contaminated floodplain groundwater, treatment of collected contaminated groundwater at Asarco's wastewater treatment plant, periodic monitoring, institutional controls, and contingency for covering Detention Pond sediments.

Terrace and floodplain groundwater contained concentrations of cadmium, arsenic, and zinc in excess of the Federal Primary and Secondary Drinking Water Standards. The Terrace Drain intercepts shallow groundwater coming off of the Terrace portion of the Plant site and that flows into the floodplain aquifer. Collected groundwater is treated at the onsite Waste Water Treatment Plant (WWTP) and discharged into the City and County of Denver's sanitary sewer system in accordance with Asarco's discharge permit. Floodplain groundwater, moving in a northeast direction, is monitored quarterly. A water-use survey of neighboring area wells showed that none are being used for drinking water. Studies have shown that the terrace drain has been effective in reducing metals concentration in groundwater of the floodplain both on and off site, and that metals concentrations in groundwater should continue to decrease over time.

The IDD is a ditch that runs along the western boundary of the plant site. It flows into the 51st Avenue Retention Ponds. Water from the Retention Ponds is then treated at the WWTP. Sediments with elevated levels of metals from the IDD and Retention Ponds have been removed.

The Northside Sewage Treatment Plant (NSTP) Detention Pond is located along the path of surface flow from the IDD to the South Platte River. Because the IDD received groundwater from the Asarco Globe Plant, as well as surface water and groundwater from the large urban area surrounding and upstream of the Globe Plant, the sediments within the Detention Pond had elevated levels of metals and organics. Sediments in the Detention Pond are perennially covered with water, are not exposed, and do not pose a risk to human health. Therefore, no cleanup was required. Capping will occur if the sediments in the pond become exposed.

Community Soils and Vegetable Gardens

The Community Soils and Gardens Operable Unit is described as any property within or generally adjacent to the Globe Plant where metals concentrations in soils exceed any of the health-based action levels (*See Table 1*). Properties that exceed action levels were identified through a property-by-property sampling and testing program.

The community soils remedy called for removal and replacement of the top 12 inches of soil, and 18 inches in vegetable garden soils, where metals concentrations exceed 73 parts per million (ppm) cadmium, 500 ppm lead or 70 ppm arsenic. Residents could opt to have their property cleaned if soils contain more than the average background for arsenic at 28 ppm. An additional action level of 500 ppm for zinc applied to garden soils.

Metal	Residential (ppm)	Commercial/Industrial (ppm)
Arsenic (As)	>70	>70
Cadmium (Cd)	>73	>73
Lead (Pb)	>500	>1460
Zinc (Zn)	>500	>500

Table 1: Soils Metals Action Levels Community Soils

In general, the order in which remediated took place was 1) schools and parks; 2) required residential areas; and 3) commercial areas. The remedy included implementation of public information and education as well as a medical monitoring program.

As of the fall of 2002, all residential properties (approximately 700) in the area immediately surrounding the Asarco Globe Plant that exceed the State action levels have been remediated. A number of commercial and industrial properties have not been sampled, while others have been sampled but not yet remediated. Because of Asarco's financial situation, a national trust fund has been established to assure Asarco's ability to address environmental liability. CDPHE has requested funding for the project from the Asarco Trust ($3,500,000 over three years, FY04-06) for the past two years. None has yet been allocated.

In 2002, the State and Asarco modified the Statement of Work so that the commercial/industrial action level for lead was changed from 500 ug/l to 1460 ug/l, which is consistent with the Hazardous Materials and Waste Management Division's Proposed Soil Remediation Objective Policy. It was hoped that by reducing the number of commercial/industrial properties that require remediation for lead, Asarco could redirect available funds to the residential cleanup while still providing a protective cleanup for those commercial/industrial properties that are significantly impacted.

Medical Monitoring

The Globeville Medical Monitoring program was established in 1994 to evaluate whether past or current residents have been exposed to metals from the Asarco Globe Plant. Since the program began, 1,550 individuals have had their blood and/or urine tested to determine their exposure to cadmium, lead and arsenic. An updated cancer cluster survey was also performed to evaluate long-term carcinogenic effects from exposure to both arsenic and cadmium.

In addition to health education and individual interpretation of results, the program offered individual follow-up by a program physician. Medical monitoring was offered throughout the duration of community soil remediation.

Residents living or working in the area bordered by I-70, I-25, 64th Avenue and the South Platte River were the main focus of the testing program. Overall, Globeville residents in this area have average blood and urine values for lead, cadmium and arsenic, similar to average levels seen elsewhere in the United States.

CDPHE has not seen community-wide evidence of health effects due to exposure to heavy metals originating from the Asarco Globe Plant. The individuals tested for the most part have had cadmium, lead and arsenic levels below action levels established by CDPHE. A test result above an action level does not mean a person is ill, but indicates the need for further review by the program physician who then makes a recommendation for follow-up consultation or additional medical testing or evaluation.

Six percent of children tested (eight children) had a blood lead level above the program action level of 10 ug/dl (micrograms of lead per deciliter of blood). The program provided follow-up activities to all of these children, including environmental investigation of their homes. In 5 cases, the source of the lead exposure appeared to be lead-based paint only. In two cases, both lead-based paint and, to a lesser extent, lead-contaminated soil in their yard or play area were apparent sources of lead exposure. No source was identified for one child, who upon later being retested was found to have a normal blood lead level.

Six percent of the individuals tested (63 individuals) had a blood cadmium level above the program action level of 2 ug/L (micrograms of cadmium per liter of blood). Elevated level of cadmium in blood can indicate recent exposure to cadmium. Of these individuals, the vast majority (57 individuals) were or had been cigarette smokers. There is a proven link between elevated blood cadmium levels and cigarette smoking. Smoking appears to be the most significant current exposure to cadmium for people tested in the Globe area. Six non-smokers had elevated blood cadmium levels.

Elevated levels of cadmium in urine indicate long-term exposure to cadmium and accumulation of cadmium in the kidneys. Three percent of those tested (21 individuals) had urine cadmium levels above the program action level. Of these, nine individuals have been cigarette smokers, which indicates that the rate of having urine cadmium test result above the action level is not higher in smokers than non-smokers. Long-term residents – people who have lived longer than 30 years in the Globe area – are approximately four times more likely to have urine cadmium test result above the action level than people who have lived fewer than 30 years in the area.

No one has had an elevated urine arsenic test since the program began. However, because arsenic is removed quickly from the body through the urine, this test will only show arsenic exposure that occurred within the past two or three days before the sampled was collected.

Plant Site

In the Record of Decision, the preferred alternative for the Plant included measures to address air pollution from the site, exposed soils and sediments onsite, and Plant floors and sumps (sources from Plant infrastructure) (***See Figure 4***). Institutional Controls include restrictions for future use of the Asarco Globe Plant property to industrial land use that requires similar or more restrictive exposure levels and proper maintenance of vegetative cover and erosion control.

The Asarco Globe Plant includes 53 current and former manufacturing and support buildings used for production, offices, and wastewater treatment. Because large-scale operations at Asarco have ceased, the risk of release from any of the buildings has been minimized. Should the property be redeveloped, issues will arise that will require coordination with CDPHE to assure

that any future use is consistent with the remedy. Care must be taken to prevent or minimize exposure to contaminated soils during demolition and excavation activities.

The goals of the air emissions remedial action were to minimize point source and fugitive emissions of cadmium and arsenic from the Asarco Globe Plant and to reduce human health risk. With the end of large-scale refining in 1993, point source emissions are no longer a concern.

Ambient air monitoring is conducted at four existing monitoring stations near the Plant boundaries on at least a once every six days to measure for fugitive and dust emissions.

Clean-up goals for the plant site

- Air pollution source controls and fugitive emissions and dust controls
- Emissions restriction of 162 kilograms cadmium per year
- Excavation, covering, deep tilling, or exposure controls for plant soils above worker/trespasser action levels
- Excavation and stabilization of sediments
- Sealing of floors and sumps as necessary
- Secondary containment in Plant sumps
- Spill control of retention pond

Figure 3

The Asarco Globe Plant continues to operate some specialty and high-purity metals processes. Emissions from the new processes are within the cancer and non-cancer risk levels proscribed by the remedy.

Cadmium, arsenic, lead, and zinc concentrations are elevated in the upper 24 inches of site soils because of historical smelter operations. The goals for the Asarco Globe Plant surface soils are to prevent or minimize exposure of community residents to windblown soils from the Plant through use of vegetation or by covering them; to prevent or minimize migration of metals from Plant shallow soils to surface water and groundwater; to prevent or minimize exposure to trespassers or workers to soils with elevated metals concentrations; and to maintain a continuous fence around the Plant property.

Surface soils at the Plant will be remediated according to the level of contamination and in such a manner that the resulting topography will blend with the natural landscape, be stable, create positive stable drainages, and have vegetative covers to ensure long-term viability and prevent erosion.

Surface soils that exceed the worker/trespasser action levels (cadmium, arsenic or lead above 9125 ppm, 426 ppm, and 3000 ppm respectively) will be remediated by capping or deep tilling to prevent exposure. Capping consists of 12 inches of soils or two inches of asphalt or other durable cover. Deep tilling will be allowed where tilling will mix the soils so that the overall concentration is brought below the worker/trespasser action level for each metal. For all capped areas that are not paved or covered with gravel, a vegetative cover will be established.

Surface soils that exceed the community soil action levels in the upper six inches, but are less than the worker/trespasser action levels, will be remediated by providing a vegetative cover that endures long-term viability and prevents erosion, or by placing a minimum of 12 inches of soils or a two inch asphalt cover.

After the completion of the residential portion of the community soils remediation, community soils covered approximately 30% of the Plant site.

In 2002, because areas needing cover at the Plant remained, the EPA began placing soils removed from residential properties in the Swansea, Elyria, Cole and Clayton neighborhoods on the Plant. Residential yards in these neighborhoods are being remediated as part of the Vasquez Boulevard and Interstate-70 (VB/I-70) Superfund site. Residential soils being remediated at VB/I-70 have levels of arsenic and lead similar to residential soils in Globeville, but no cadmium.

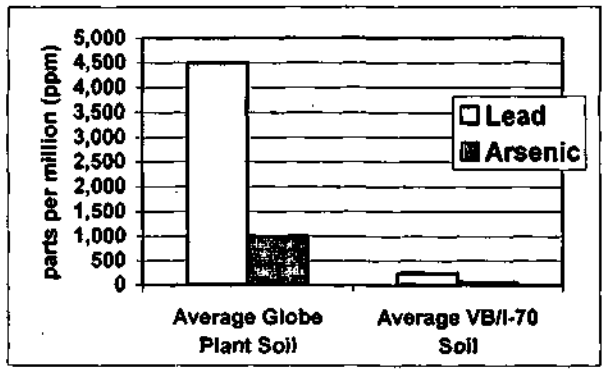

Figure 4: Comparison of existing soils on the Globe Plant with residential soils from the VB/I-70 Superfund Site.

Placement of the VB/I-70 soils is consistent with the remedy design agreed to by the State and Asarco in the Statement of Work of the Consent Decree for the Asarco Globe Plant. Soil placement will likely continue until the VB/I-70 project has been completed. Reduction of contaminant levels in the surface soils should facilitate future development of the property.

The community soils placement activities at the Plant have improved drainage on the Plant. A berm that runs the length of Washington Street on the west side and that prevents any runoff from reaching the City and County of Denver right of way, was constructed with community soils. In addition, several hundred trees and shrubs have been planted along the western boundary of the plant site that will provide protective cover, erosion control, as well as serve as a visual barrier to the Asarco Globe Plant.

The Sedimentation Pond is a small pond in the northeast corner of the Plant that traps sediments in surface water runoff from the northern portion of the Plant. The Pond was taken out of service in the early 1980s by filling it with building demolition material, regrading the area to a relatively smooth surface, and covering sediments in the pond with a thin clay cap. The Pond's metal-contaminated sediments contaminated shallow groundwater.

In late 2003, materials contained within the Sedimentation Pond were excavated, placed on the Former Neutralization Pond, and covered with approximately 4000 cubic yards of clean fill material. A vegetative cover will be established to ensure long-term viability and prevent erosion.

The goal of the Spill and Runoff Control Pond Remedial Action is to prevent or minimize any surface runoff from active areas of the Asarco Globe Plant that may contain elevated metals from entering other areas of the Plant or from leaving the Plant. Because large-scale operations were discontinued at approximately the same time as the signing of the Decision Documents, the risk of spills was minimized.

Section 3.0
Community Involvement

3.1 Community Profile
Globeville is working-class community with a rich and diverse history. Located just 20 blocks north of downtown Denver, Globeville is surrounded by industry whose development helped build Globeville and Denver. The community takes pride in the rich and diverse history of the area.

In 1886, Edward R. Holden built the Holden Smelter north of Denver along the Platte River. While people had moved into the area before the smelter was built, the smelter helped attract workers that eventually formed the town of Globeville. In 1889, the smelter was sold and the name changed to the Globe Smelting and Refining Company. Globeville was formally incorporated in 1891.

Globeville was settled largely by Volga Germans, Poles, Slovenians, Croatians, and Russians, although by the 1920s residents represented over 50 nationalities. Each group brought with them rich cultural and religious traditions. The major groups settled amongst themselves, forming smaller neighborhoods. They built churches and formed clubs and associations that helped preserve their cultures.

While they worked to preserve their own cultures, the people of Globeville also began to form a distinct identity. Conflict between the various groups was not apparent and Globeville fought its annexation into the City of Denver in 1903. Travel between Globeville and Denver was awkward and indirect, and residents stayed in their community to work, shop and live. In the early years, people left only in the summers to go work in the beet fields.

While Globeville had always been a working class community, where industry and homes were often located side-by-side, several significant events began to change and fragment the community.

In the early 1950s, the 232-unit Stapleton Homes housing project was built in the "Dobrinka" Volga German section of Globeville between 51st and 52nd Avenues and Logan and Acoma Streets, adjacent to the Asarco Globe site. Four homes were torn down to make way for the project, which provided subsidized low-income housing.

The construction of Interstate Highway 25 (I-25) in the 1950s and Interstate 70 (I-70) in the late 50s and early 1960s had a more devastating affect. The highways cut through Globeville and resulted in the destruction of seven blocks and over 30 homes. Only Lincoln and Washington Streets remained open to north-south traffic. As they had been over a half a century before, much of Globeville was again isolated from Denver.

In 1991, the Stapleton Homes was torn down, an event that impacted the neighborhood. Many of Globeville's current residents either grew up in, or had life-long friends who lived in Stapleton Homes.

In 1991, the Federal government made a $4 million grant available to the Denver Housing Authority intended for renovation of Stapleton Homes on the condition that the city could guarantee that the facility would be used for the next 40 years. Among the many issues being considered at the time, the project was in need of lead paint and asbestos abatement, concern was escalating about the proximity of the project to the I-25 corridor, and the DHA was moving toward a dispersed housing policy. A number of Stapleton Homes residents had voluntarily left the project as more information became available about heavy metals contaminations in the area. The fact that 100 of 226 available units were already vacant contributed to DHA's decision to demolish rather than renovate the project. The general impression of the public, supported by a large segment of the media, was that this was an evacuation based on contamination from proximity to the Asarco Globe site.

Today, Globeville continues to include a mix of residential and industrial activity. The area has experienced significant change in the ethnic and cultural makeup of its citizens. Over the years Latino families moved into Globeville and now compromise the largest ethnic group in the area. In 1950, there were only twelve Latino households in Globeville. In 2000, seventy-seven percent of Globeville's population was Latino. As the residents change, so do Globeville-area businesses, with many local businesses catering to, and owned and operated by, Latinos.

Litigation activity regarding the Asarco Globe site polarized the area. Residents south of I-70 were not included in the class action suit (Escamilla v. Asarco, Inc., 1991). The complex sampling methodology cited in State of Colorado v. Asarco, Inc. – beginning at properties closest to the plant and working outward – added to the perception that residents' properties south of I-70 may be contaminated but excluded from any recourse from Asarco, Inc's, liability. Consequently, a degree of animosity had developed toward residents north of I-70, and litigating agents.

The people of Globeville were, for the most part, relieved at the settlement of the two major lawsuits, and in particular to know that they were going to "have their neighborhood back." The community now appears to be working on building a sense of cohesiveness and self-esteem by involving itself in projects aimed at improving quality of life. The cohesive glue for the

Indicators	Globeville	Denver
Total Population	3,471	567,783
# Children <18	1,204	137,030
# Elderly 65+	216	57,944
% Population African American	2.6	10.8
% Population Native American	1	0.7
% Population Asian/Pacific Islander	0.8	2.8
% Population Latino	77.5	31.7
% Population Non-Latino White	17	51.9
% Foreign Born	37.5	17.4
% Births to unwed mothers	49	34.3
% Children Living with Single Parents	21.9	28
% Households living at current address < 1 year	22.2	28.7
% Housing units built before 1940	48.5	24.5
% Housing Owner-Occupied	59.8	49.9
% Renters paying more than 30% of income on Housing	43.4	38.6
Average home sale price	138,828.00	254,919.00
% Children (< 18) in poverty	28.8	20.8
% Persons in poverty	23.2	14.3
Average annual wage	32,816.50	37,406.80
Average household income	37,063.00	55,128.60
% Persons age 25+ w/ < 12th grade education	63.4	21.1
% Persons age 25+ w/ high school only education	20.9	20
% Persons Age 25+ w/college degree (Associates or Better)	5.8	39.4
% Students not English proficient	34.8	20.5
% 12th graders who graduated	18.3	15.6
Crime rate per 1,000 Persons	176	83.4
Burglary crime rate per 1,000 households	70	28.7

Table 2: Demographic, economic and social indicators for Globeville and Denver.
Source: The Piton Foundation.

residents appears to remain in the churches in the area, the neighborhood centers and the neighborhood groups.

Many local community groups are active in the Globeville area including the Globeville Civic Association, Cross Community Coalition/ Colorado People's Environmental and Economic Network (COPEEN), the Elyria/Swansea/Globeville Business Association and the newly formed Globeville United Neighborhoods Group. In addition, other social-service, cultural and recreational services are provided by a number of agencies and organizations. Examples include Laradon Hall, the Stapleton Recreation Center, the Globeville Recreation Center and the Argo Park.

The EPA defines Environmental Justice (EJ) as the "fair treatment for people of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies." Over the last fifteen years, attention to the impact of environmental pollution on particular segments of our society, such as minority and/or low-income populations, has been steadily growing.

The EPA Region 8's Environmental Justice Small Grant program awarded approximately $20,000 to Cross Community Coalition/COPEEN, a local services organization. The funds are being used to conduct research on the health effects caused by living in close proximity to I-25 and I-70. Research will also be conducted on how other communities combat the health effects of heavily polluting freeways.

3.2 History of Community Involvement

This is the third update of the Asarco Globe Community Involvement Plan (CIP) since 1986. The first plan was prepared in 1986. It was updated in March 1989 and again in January 1995.

Two mailing lists of persons interested in the site were developed to keep the public informed. A general mailing list was developed for larger public meetings and issues of general interest. This list includes State of Colorado elected officials, City and County of Denver officials, Adams County Officials, area media, community organizations, as well as approximately 600 area residents. A working group mailing list of approximately 70 individuals and entities was also developed for those interested in more frequent updates on site status, including leaders of local community organizations and governmental representatives.

Numerous public meetings have been held in the Globeville area throughout the clean-up project. A community meeting was held on the first Tuesday of every month at Laradon Hall in the Globeville neighborhood. Meetings were conducted in English with Spanish language interpretation also being provided. Meetings covered project updates, medical monitoring and community concerns. As remedial work was completed, there was no longer the need or interest in monthly meetings.

The January 1995 CIP lists twenty-five additional public meetings that took place between January 1986 and May 1993. These include informational meetings, working group meetings, and meetings to discuss a Public Health Evaluation, a Feasibility Study, and the Proposed Plan.

State of Colorado project staff has also met with concerned citizens, city and county representatives, local community groups, and EPA representatives as necessary to discuss the site.

The Colorado Department of Public Health and Environment employed a fulltime, bilingual Community Health Outreach Coordinator for the translation of all pertinent written information, representation at community meetings, community outreach and response to inquiries and/or comments from the public.

Fact sheets and handouts, many of them both in Spanish and English, have been relied upon heavily to inform Globeville residents. Over thirty such fact sheets have been prepared and distributed to community members since the beginning of the project. Fact sheets have covered issues such as health risks of heavy metals, gardening in Globeville, the medical monitoring program, and milestones of the regulatory process such as the Feasibility Study, Proposed Plan and Record of Decision.

Press releases were widely used by CDPHE to inform the community on the site status. The January 1995 CIP lists seventeen press releases about the Asarco Globe project between October 1985 and June 1994. Since then, six more press releases have been issued by CDPHE regarding the Asarco Globe remediation and medical monitoring.

CDPHE organized a groundbreaking ceremony in June 1994, held at the site of the first residential property to be remediated. Community members, local business people and the media were invited. State of Colorado, EPA Region 8 and city and county representatives also attended.

The RI, PHE and FS reports were issued in draft form and were made available to the public for comment. Extensive public comments were received on each document; these comments were considered when the documents were finalized. Public meetings were held to discuss the findings of each of the documents. Transcripts of the public meetings are available in the Administrative Record. The final versions of each document includes detailed responses to the public comments received.

Public meetings addressing the Proposed Plan were held in 1992. A summary of the comments received, written or oral, and responses are contained in the responsiveness Summary of the Record of Decision.

A number of information repositories containing the primary documentation for the site were available to residents throughout community soils cleanup and medical monitoring. Repositories were provided at the Globeville Civic Association, the Commerce City Branch Library, and the Globeville Area Business Association, all located close to the site. The complete Administrative Record was available at CDPHE, the Colorado Attorney General's Office, the Central Denver Public Library, and the Stapleton Recreation Center in Globeville. Copies of a video demonstrating the remediation plan for Asarco Globe are available for free check out at the Stapleton Recreation Center, Community Center, the Globeville Health Clinic, Transfiguration of Christ Church, the Civic Association, and at the local Safeway store.

3.3 Community Relations – Environmental Protection Agency

The EPA has been an important partner in Community Involvement activities in Globeville. EPA representatives attended and participated in the state-sponsored monthly public meetings.

The EPA also awarded a Technical Assistance Grant (TAG) program for the Asarco Globe cleanup. The TAG application was submitted to the EPA by the Globeville Community Resource Center on June 6, 1994. The grant was awarded in July 1994.

3.4 Community Relations – Asarco, Inc.

Upon resolution of the Escamilla v. Asarco, Inc. class action suit and the Natural Resources Damages Suit, Asarco began soil remediation of the properties in the Globeville area. The company also began its own community relations program and hired a community involvement consultant in an effort to help residents understand the cleanup process.

The most notable community relations contribution made by the company to date has been the purchase of a residential property within the clean-up area near the plant, and its conversion into a information center. A bilingual member of the community staffed the Globeville Information Center. It offered residents, property owners and interested individuals information on the clean-up process, a central location to obtain information, and the opportunity to get answers to questions and provide feedback on the remediation. The grounds serves a model of the type of remediation that took place at residential and commercial properties.

Asarco also contributed to community development by enhancing its remediation activities. As a part of remediation at Argo Park, the community's largest and most popular park, Asarco, with the cooperation of the City Of Denver Parks and Recreation Department.

In addition, Asarco has:

- operated a summer intern program
- provided financial assistance to the Stapleton Recreation Center
- produced a monthly newsletter, *Update*, in both English and Spanish
- Conducted community focus group meetings, two each in Spanish and English, with residents and business leaders to generate and evaluate community relations program ideas and information needs.
- Funded the Denver Audubon Society's Urban Environmental education Project which involves parents and community members in hands-on activities for fourth grade students at Garden Place Elementary School.

3.5 Community Interviews

Interviews were conducted with community residents, community leaders, local businesses, a local agency representative, and a representative from Asarco, Inc.. Interviewees were identified by project staff, by other interviewees and by random selecting businesses.

For many interviewees, it has been several years since they have had regular involvement with CDPHE, Asarco, or the contractors performing the community soils cleanup. Since residents were mostly involvement with the community soils remediation, residents interviewed knew more about the soils cleanup than remediation at the Plant or at commercial or industrial properties.

Nearly every respondent believed that they had been well informed by CDPHE and Asarco. One respondent felt that it had been difficult to reach staff at the EPA. One respondent said that the State hadn't done enough to explain the three litigation cases against Asarco, and that the community had always been confused about various cases and their impacts on the remediation.

Both the Asarco representative and a prominent community leader independently confirmed that two-way communication with Globeville began slowly and that through the process, community involvement improved.

Residential Yards Cleanup

All but one interviewee was generally happy with the community soils cleanup. Interviewees noted that the community soils cleanup proceeded effectively, that it beautified their neighborhoods, and that the stigma of the contamination was lifted. Concerns and complaints focused on the quality of the replacement soil. Several residents said the soil was either too sandy or too high in clay content, and that it took time to establish healthy lawns and gardens.

Many interviewees commented that it was unfortunate that some residents allowed their yards to fall into poor condition. One respondent said "some yards looked like a million bucks, others next door were left unkept."

Asarco Globe Plant Cleanup

Interviewees understanding and feelings about the Globe Plant site were varied. Those who had prominent roles in the cleanup had a better understanding of the work that had been performed at the Plant site, and the work that remained unfinished. Some stakeholders and residents were uncertain of the current state of remediation at the Plant, and assumed that much work remained. Many interviewees commented on the soils being brought onto the Plant from the VB/I-70 Superfund Site.

A business owner adjacent to the site indicated that he had received no information on the Plant site and was worried about the new soils being brought onto the site. He indicated that he now had dust problems in his business, whereas before he didn't.

While one key stakeholder called the placement of VB/I-70 soils on the Plant "a stroke of genius," others were worried about dust control and recontamination of their neighborhoods.

Several interviewees commented on the trees and shrubs that were recently planted along Washington Street with Natural Resource Damages funds. All believed that the planting was a good thing for the community and that it improved the aesthetics of the Plant.

Interviewees had all sorts of ideas of what the Asarco Globe Plant property might actually be used for someday. Ideas included a commercial and industrial park, open space, installing a cap and sodding it, a golf course, a museum, a parking lot, a library, and a retail mall or shops.

Many urged that any redevelopment of the site must be carried out with the community's health as the top priority. That building demolition, regrading of the site, or digging for building foundations and utilities would have to guarantee no dust emissions to surrounding residents and businesses. A community leader emphasized that the developer would need to involve and communicate with the surrounding community, and that CDPHE would have to hold any redevelopment to the same criteria for cleanup found in the Consent Decree.

Many interviewees also noted that residential use should not be allowed and that future use should boast local economic development. One respondent noted that Globeville needs more retail shops and that Globeville residents must often venture outside of their community to shop.

Several residents asserted that whatever the future use, that it be "community friendly." Something that "looks nice," with ample landscaping.

Several interviewees had heard that Asarco might be having financial difficulties. Interviewees seemed evenly spilt about whether this was cause for concern. Some believed that the cleanup of the Plant site might be in jeopardy if Asarco was unable to fund the cleanup, and that southern Globeville might have problems completing any remaining soils remediation and receiving any outstanding payments. One resident felt that the Plant site was cleaner now that it had been in the past, while another commented that residential yards had already been cleaned up and that Asarco's situation was unlikely to affect them.

Commercial Cleanup

Many interviewees, including several community leaders who had played roles in organizing the community, were unclear about the status of remediation of commercial and industrial properties. They were unaware that Asarco has not fulfilled all of its obligations to remediate commercial properties. Several interviewees noted that many commercial properties are paved and that this would protect residents from any contamination underneath. Several others observed that industrial yards are unpaved and that they see high levels of truck traffic that release dust emissions. They were concerned that unremediated properties could release contaminated dust into their neighborhood.

One resident was worried about future redevelopment of commercial and industrial areas that have yet to be remediated. She compared this situation with future redevelopment of the Plant site itself.

Communication

While nearly all interviewees felt that community involvement and communication with local residents was satisfactory during community soils cleanup, several noted, "It had been a while since they heard anything about Asarco." Since the community soils cleanup has been completed and remedial activities have slowed over the last couple of years, this is understandable.

A majority of residents questioned felt that direct mailing was the best way to reach community members and project participants. Several noted, however, that flyers or letters mailed to homes are often ignored. One respondent advised against hand delivering flyers by placing them on gates and doors because they rarely make it to the homeowner or resident.

Those who noted the problems with direct mailings all suggested using existing community group meetings to gain access to local residents and using local groups to assist in door-to-door distribution of materials. One community leader, with a long record of outreach activities in Globeville, asserted that face-to-face distribution of information works tens times more effectively than simply mailing flyers to homes. People are able to ask simple questions and understand the issue quickly and more clearly.

Many residential interviewees said they were unaware that the State and the EPA had held public meetings as recently as late 1993 in Globeville. Advertising for those public meetings, which presented the placement of VB/I-70 soils on the Globe Plant, was handled through direct mailing to the State's Globeville mailing list. The second of these public meetings was well attended by approximately 30 Globeville residents.

Public meetings were identified as another important way to get information to the public. However, several interviewees warned that meetings are generally only well attended when the issues are pressing and directly impact residents' lives. Residents suggested that general update meetings be held on occasion, or when necessary, to keep the community informed.

Providing food, childcare, and translation services were identified as key elements to a successful meeting. Food was identified as a key element in attracting meeting participants. Another recommendation is to co-sponsor public meetings with established local groups that are well known and trusted in Globeville.

Conclusions
Community response to the residential soils remediation was positive. Residents felt that property values had increased and that a stigma had been removed from their neighborhood. Residents can now feel "secure" about their health.

3.6 Proposed Community Relations Activities

- Provide the community with accurate and timely information. To keep the community apprised of current actions, CDPHE will disseminate timely and accurate information to those listed on the community mailing list and continue to maintain and update the information repositories. CDPHE will also send news articles to local newspapers as appropriate and will keep both printed and electronic media updated. Information may include findings from the five-year review, such as sampling and/or study results; information on any potential impacts to human health or the environment; and procedures on site closeout.

- Identify and respond to community concerns and needs.